ALGO® 5 Newborn Hearing Screener

Service Manual

ALGO® 5 Newborn Hearing Screener

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Caution: Federal Law (U.S.) restricts this device to sale or use by or on the order of a physician (or properly licensed practitioner).

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1. Introduction

1.1. About this manual

1.1.1. Overview

This manual contains information needed for servicing the ALGO® 5 Newborn Hearing Screener.

- Description of the product and overview illustrations (Chapter 1)
- Maintenance Procedure (Chapter 2)
- Troubleshooting Guide (Chapter 3)
- Troubleshooting Flowcharts (Chapter 4)
- Installation and Assembly Instructions (Chapter **Error! Reference source not found.**)
- Parts and ordering information (Chapter 5)
- Index

1.1.2. Intended users

This service manual is written for qualified biomedical technicians. It describes service tasks which could lead to injury, or which could damage the device, if attempted by a person without the requisite skills.

1.1.3. Manual conventions

Precautionary information is emphasized by being labeled as warning, caution or important. Other explanatory information is highlighted with the word **Note**.

Type of information	Usage
WARNING	Identifies conditions or practices that may result in injury or death to the patient and/or user. Warnings are boxed and preceded by a hazard symbol.
CAUTION:	Precedes an action that may result in damage to or malfunction of the device.
Important!	An instruction provided to help ensure correct clinical results and provide quality assurance to the screening procedures.
Note:	Background information provided to clarify a particular step or procedure. Information in this category is not considered precautionary.

Precautionary Information

Important! *Incorrect use of the screener and its accessories, or the use of parts and accessories that are not manufactured or supplied by Natus Medical Incorporated, can*

lead to incorrect results.

Do not use your screener if there is any suspicion that it is not functioning properly, or if any parts appear damaged. Contact Natus Technical Service or your authorized service representative.

Warning! Please avoid practices that can compromise the safe and effective use of the ALGO 5:

- Do not remove the Panel PC computer from the ALGO 5 unless your service representative specifically instructs you to do so. There are no user-serviceable parts inside aside from replacement of the RTC Battery. Installation, modification, or replacement of any circuit cards, or alteration of the CMOS configuration memory outside of Natus instructions, may compromise the safe and effective operation of this device and will void the warranty.
- There is no user access to the computer operating system. Never attempt to load software into the ALGO 5 that has not been supplied or approved by Natus Medical. Attempting to load any software or to attach computer accessories or other medical devices that have not been provided or approved by Natus Medical is expressly prohibited and will void the warranty.
- Misuse of the earphones or the earphone cable (that is, any use other than that described in this manual) may result in screening at unknown and uncontrolled decibel levels.

Warning! The ALGO 5 is not suitable for use in the presence of flammable Anaesthetic Mixtures with Air, Oxygen, or Nitrous Oxide.

Warning! The ALGO 5 is an electrically isolated system only when the unit is plugged in through the Isolation Transformer built into the cart and not connected to any other external system. If the device is to be connected to a hospital network, the optional LAN Isolator (P/N 040948) must be used between the Panel PC and the hospital network to maintain electrical isolation of the device.

1.2. Product description

The ALGO 5 consists of several major components:

- Screening station (cart) for component storage and transport
- Isolation Transformer (to electrically isolate AC mains voltage provided by hospital from ALGO 5 main power)
- Panel PC (the interface between the medical personnel and the equipment)
- Acoustic Transducer Assembly 5 (ATA 5) - (calibrated earphones to deliver clicks to the patient's ears)
- Patient Cable Assembly 5 (PCA 5) - (electrodes registering EEG signals from the patient)

- Preamplifier 5 (Preamp 5) - (amplifies signals from the electrodes, also serves as isolation for the patient)
- DSP Box (processes digital signals from Preamp 5)
- Label printer
- Page printer (optional, available in inkjet or laser models)
- Bar code scanner (optional)
- LAN Isolator (optional)

1.3. Pictorial introduction to the ALGO 5

This section is meant to acquaint you with various views of the ALGO 5 that you will see in the course of troubleshooting and repairing it. The item names used in the Parts List (see Chapter 5) are used throughout the manual whenever parts are discussed.

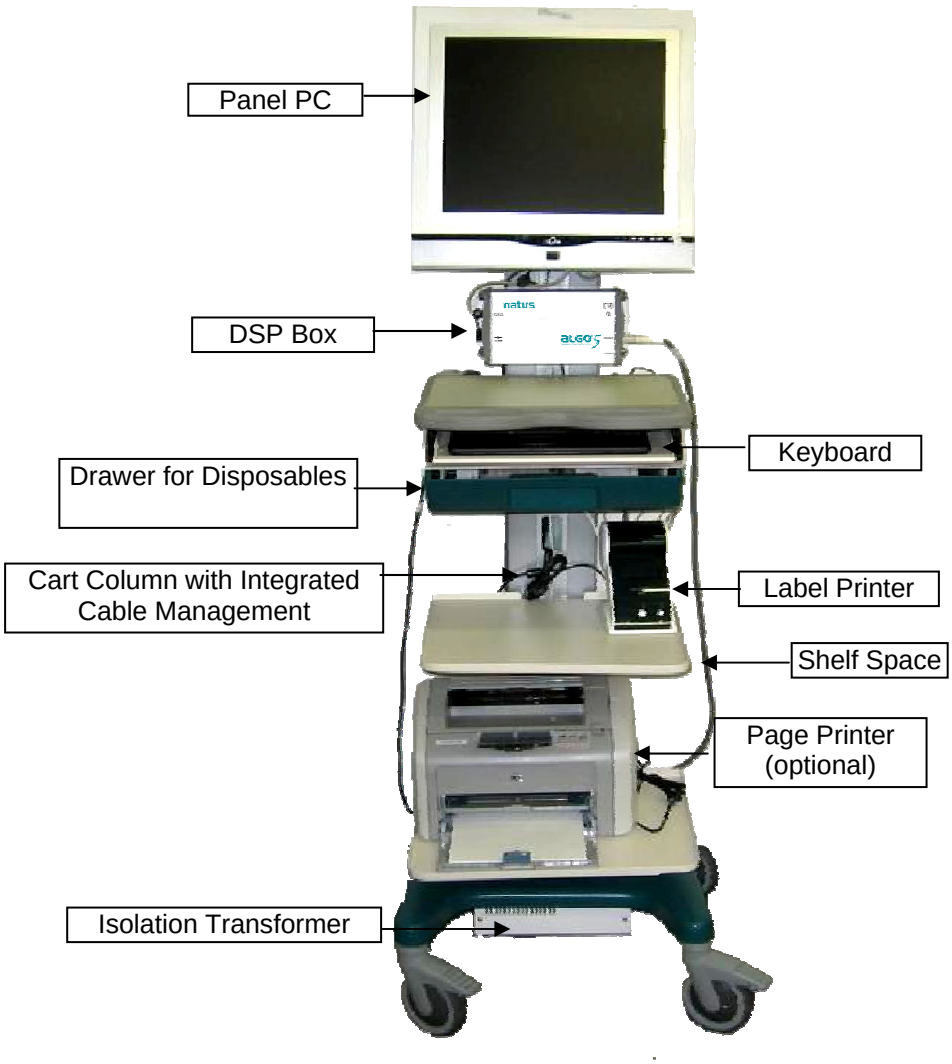


FIGURE 1: ALGO 5 — front view

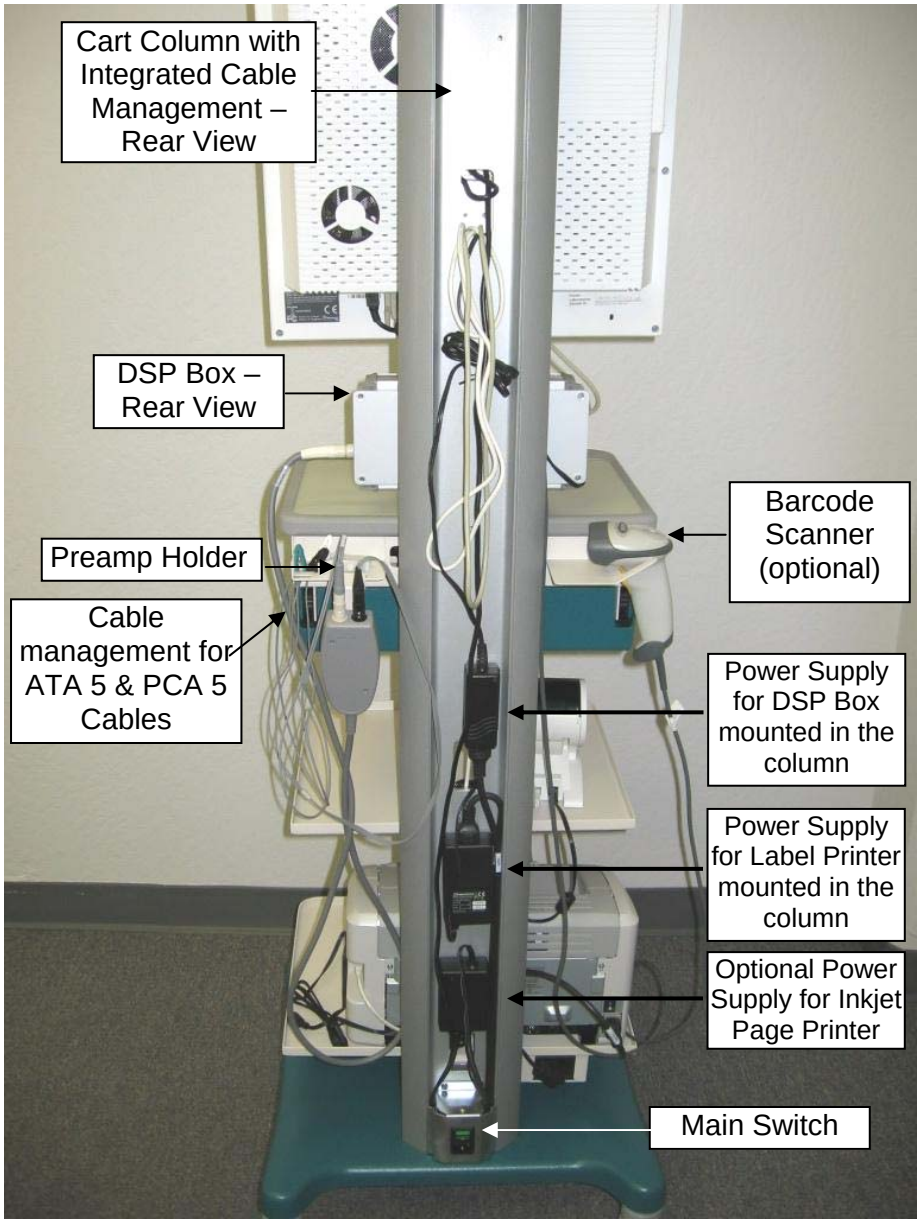

Cart Column with Integrated Cable Management – Rear View
DSP Box – Rear View
Barcode Scanner (optional)
Preamp Holder
Cable management for ATA 5 & PCA 5 Cables
Power Supply for DSP Box mounted in the column
Power Supply for Label Printer mounted in the column
Optional Power Supply for Inkjet Page Printer
Main Switch

FIGURE 2: ALGO 5 — rear view (cover removed)

FIGURE 3: DSP Box

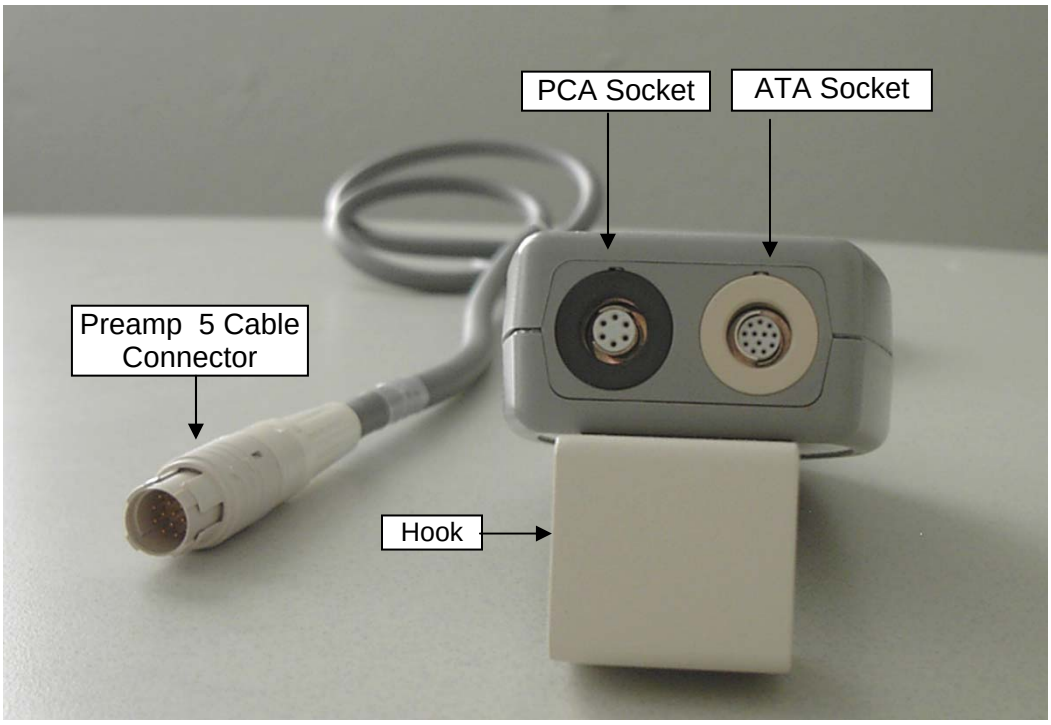


FIGURE 4: Preamplifier 5 (Preamp 5)

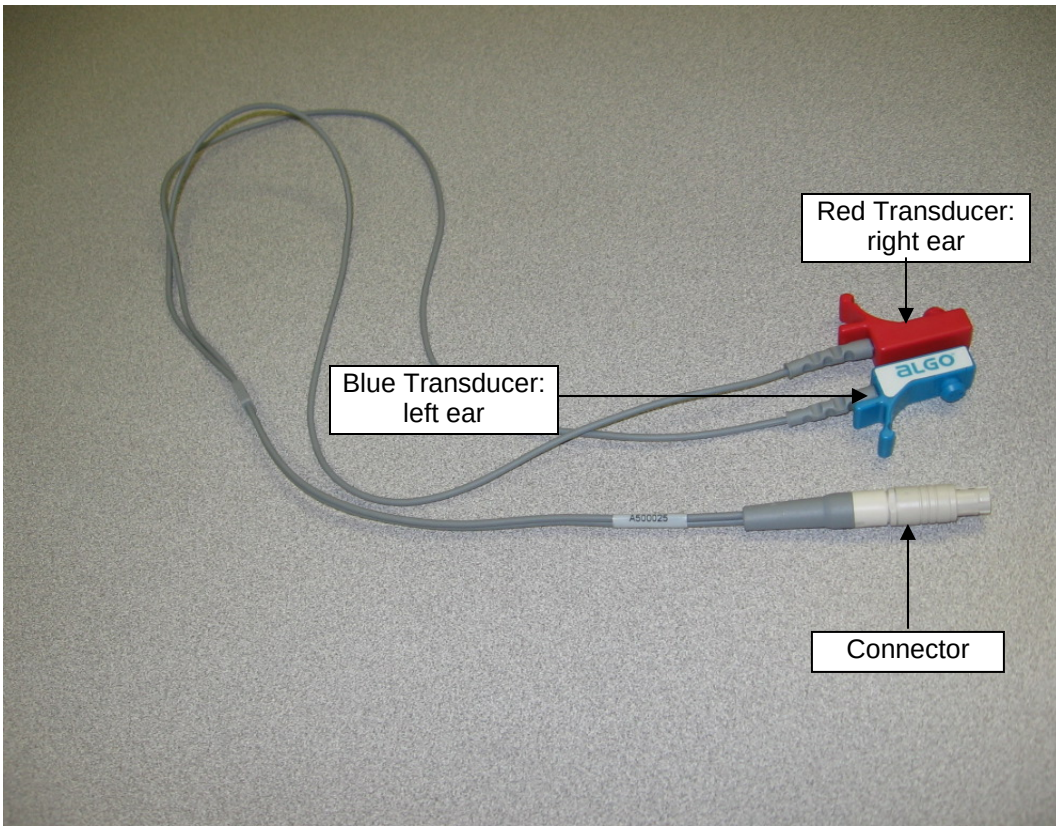


FIGURE 5: Acoustic Transducer Assembly (ATA 5)

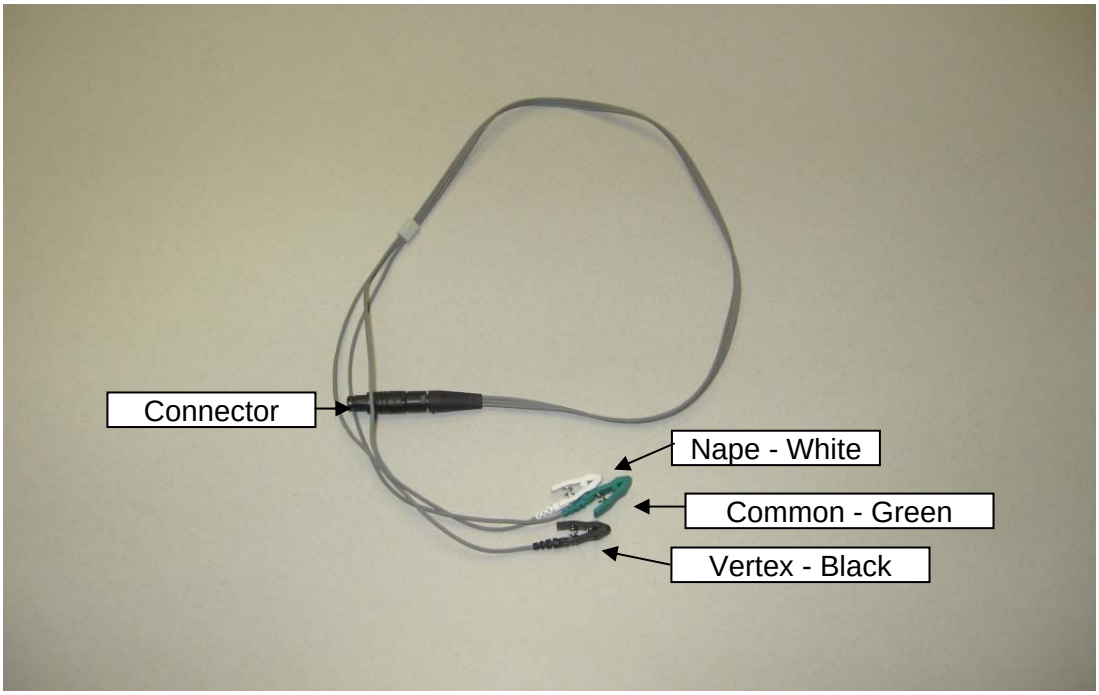


FIGURE 6: Patient Cable Assembly (PCA 5)

1.4. Before you start

WARNING	Observe Electrostatic Discharge (ESD) precautions when handling, adjusting, or performing any procedure with the device internal components.

1.5. Contacting your Natus Technical Service

Should you encounter situations that are not covered by this Service Manual, contact a Natus Technical Service representative.

Please have your Natus device model and serial number available when calling Technical Service.

United States customers: Contact a Natus Technical Service Representative at:

Technical Service +1 888 496 2887
Technical Service Fax +1 650 802 8680
E-mail: technical_service@natus.com

International Support: Please contact your local Distributor.
Distributor locations can be found at www.natus.com

2. Routine Maintenance Procedure

This chapter defines procedures for routine maintenance of the ALGO 5 screener. These procedures must be performed after any of the following events and/or as prescribed by the institution's maintenance schedule:

- Institution first receives the ALGO 5 screener.
- Foreign material or liquid has been deposited on the ALGO 5 screener.
- ALGO 5 screener has been visually damaged or subjected to mechanical shock (e.g. being dropped).
- ALGO 5 screener has been submitted for maintenance or scheduled performance verification.

2.1. Inspecting Accessory Parts

Routinely inspect screener components as described below:

- Inspect earphone cable for damage (tears, cracks, exposed wires, etc.)
- Inspect sensor cable for proper connection to the Preamp 5, for worn or broken insulation, and for looseness at the clips. Inspect Preamp 5 cable for damage.
- Inspect power cord for fraying or other damage.
- If the screener is frequently moved to different locations or subjected to heavy use, check regularly for external damage.
- Examine the Preamp 5 for cracks or dents that might have been caused by repeated banging against the side of the screener or the edge of a crib.
- Replace accessories or have them repaired as needed.

Warning! *Do not use the screener if you suspect that it is not functioning properly, or if any parts appear damaged. Contact Natus Technical Service or your authorized service representative.*

2.2. Cleaning the ALGO 5

2.2.1. Cleaning the Screener

⚠ ***WARNING***	Turn off power and unplug the screener before cleaning.

To keep the screener clean, perform the following tasks regularly:

- Remove dust from the screener's exterior with a soft brush or cloth.
- Clean the exterior case of the screener with a lightly water-dampened soft cloth.
- To clean the Panel PC, dilute a volume of glass cleaner with an equal volume of water. Spray a small amount of the diluted cleaner on a soft cloth and ***gently*** wipe the screen.

CAUTION: Press gently on the Panel PC display! Too much pressure can cause permanent damage. Do not spray diluted cleaner directly on the display.

- Clean the sensor and earphone cables with a cloth dampened with water, isopropyl alcohol, or a 10% bleach solution. ***Do not*** stretch the cables. Delicate shielding in the wires can be damaged, resulting in electrical shorting. Refer to your hospital's protocol for the frequency of cleaning equipment that comes into contact with the patient.

- Wipe off any remaining dirt or spots on the screener and cables with a cloth dampened with a mild solution of commercial detergent, hospital cleaning agent and water, or isopropyl alcohol.

CAUTION: Do not spray or pour cleaners directly on the screener. Keep liquids, including cleaning fluid, away from the screener's keyboard, earphone transducers, and other openings. Never spray cleaner directly onto the screener. Never use harsh or abrasive chemical products to clean the screener. Do not immerse patient cables or transducers in water or cleaning solutions.

2.2.2. Cleaning the cart

- The cart may be cleaned with most mild, non-abrasive solutions commonly used in the hospital environment (e.g., diluted bleach, ammonia, or alcohol solutions).
- The surface finish will be permanently damaged by strong chemicals and solvents such as acetone and trichloroethylene.
- Abrasive material such as steel wool should never be used to clean any component of the cart.
- Never submerge the cart base or allow liquids to enter any component of the cart. Wipe any cleaning agents off cart components immediately using a water-dampened cloth. Dry all components thoroughly after cleaning.
- Damage caused by the use of unapproved substances or processes will not be covered by warranty. It is recommended that any cleaning solution be tested on a small area of the cart that is not easily visible to verify compatibility.

CAUTION: To clean or sterilize mounted instruments or accessory equipment, refer to the specific instructions delivered with those products. Consult your hospital's infection control officer or epidemiologist.

2.3. Safety testing

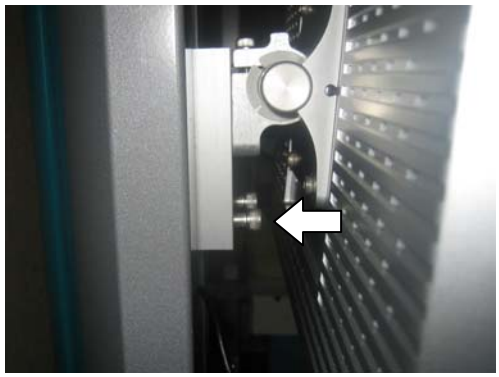
The safety tests meet the standards and are performed in accordance with, IEC 60601-1, (Amendment 1, Amendment 2,) and UL 60601, for instruments as Class 1 and Type BF and ANSI/NFPA Standard 99.

Applicable tests for these standards are listed in following sections (2.3.1-2.3.3). Technicians must be familiar with the standards applicable to their institution and country.

2.3.1. Ground Integrity

1. Unplug the ALGO 5 power cord from the wall outlet. Make sure it is a 3-prong power cord (with ground).

2. Using an Ohm Meter, measure impedance between the positive and negative contacts to get a baseline impedance.
3. Using the Ohm Meter, measure the impedance from the ground pin on the outlet plug to any screw on a cart column, such as the bracket that attaches the panel PC to the column.



4. Subtract the measured value from the baseline value measured in step 2 to get the ground integrity value. Verify that the impedance is less than 100 milliohm (0.1 ohm).
5. Ground integrity should be checked whenever a shelf is adjusted in height.

100 milliohms or less

TABLE 1: Ground Integrity

2.3.2. Earth leakage current

AC Polarity	Line cord	Neutral cord	IEC 60601-1	UL 60601-1 ANSI/NFPA 99
Normal	Closed	Closed	500 µA	300 µA
Reversed	Closed	Closed	500 µA	300 µA
Normal	Open	Closed	1000 µA	500 µA
Normal	Closed	Open	1000 µA	500 µA

TABLE 2: Earth leakage current

2.3.3. Enclosure leakage current

AC line cord polarity	AC line cord neutral conductor	AC line cord ground conductor	IEC 60601-1	UL 60601-1 ANSI/NFPA 99
Normal	Closed	Closed	100 µA	300 µA
Normal	Closed	Open	500 µA	500 µA
Normal	Open	Closed	100 µA	300 µA
Reversed	Closed	Open	500 µA	500 µA
Reversed	Open	Closed	500 µA	300 µA
Reversed	Closed	Open	500 µA	500 µA

TABLE 3: Enclosure leakage current

2.4. Performance verification

An equipment check is available using the Main Window of the Panel PC (see FIGURE 7 in Section 2.4.1). If the equipment check option is not available from the main window, access the Service Menu from the Preferences panel to acquire rights via the Profile Manager.

2.4.1. Equipment Check for the ALGO 5 screener

Access the Equipment Check from the main window:

FIGURE 7: Main Window

Use the ALGO Check Kit to run the Equipment Check:

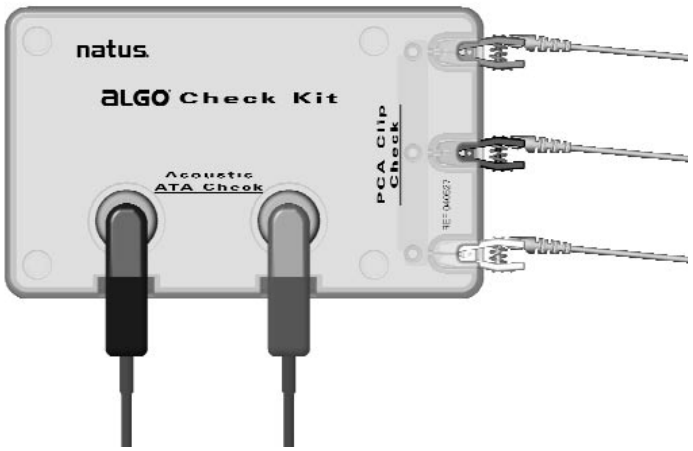


FIGURE 8: ALGO Check Kit

The Equipment Check comprises the following routines:

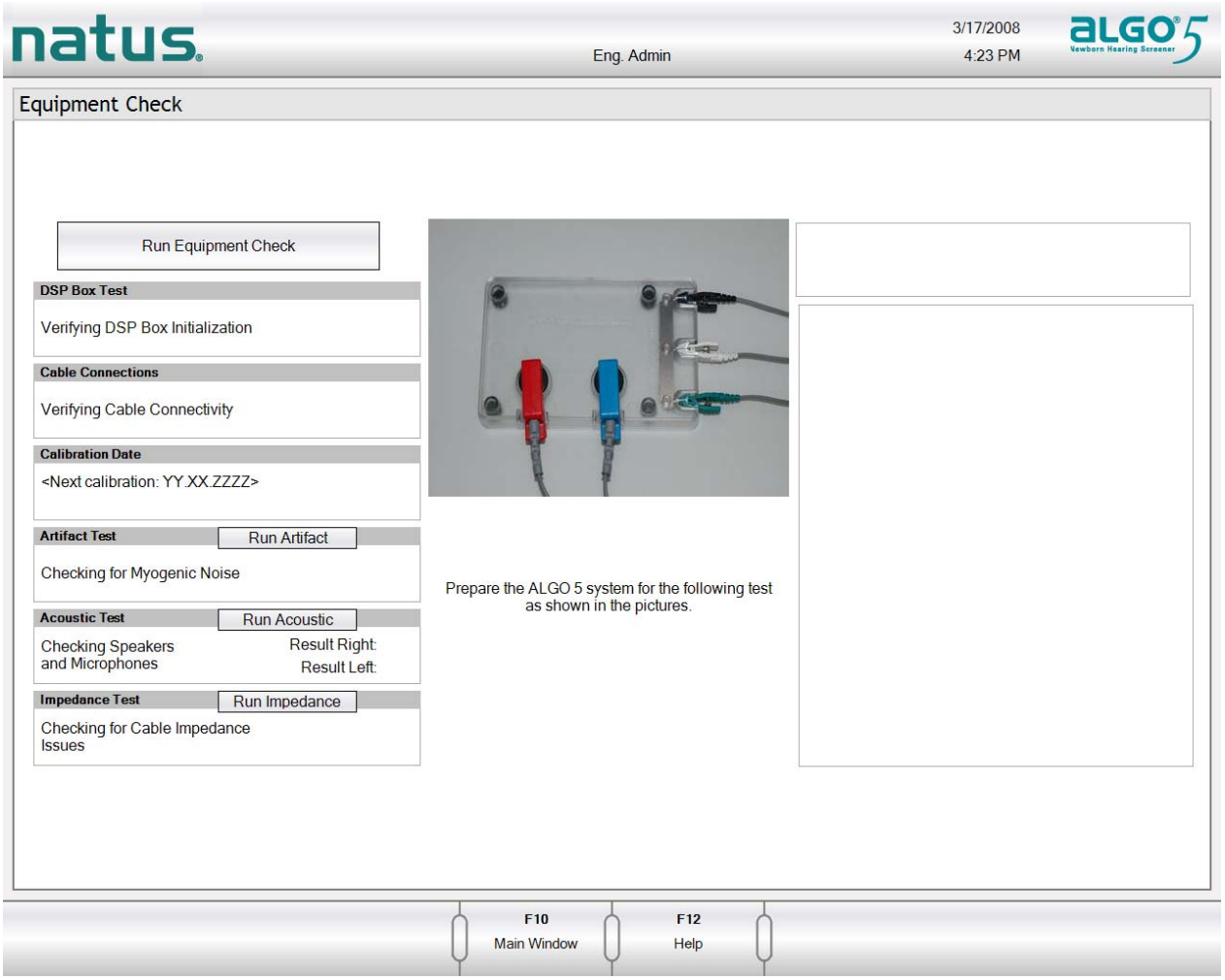


FIGURE 9: Equipment check

- Initialize Baseboard Test

DSP board runs a self-test and loads firmware

- Cable connection

Verifies connectivity of ATA 5 and Preamp 5

- Calibration dates

Shows calibration date of ATA 5 (refer to 2.4.2.2 – ATA 5 Cable calibration due)

- Artifact Test

Runs internal DSP test program

- Acoustic Test

Verifies ATA 5 equipment

- Impedance Test

Verifies electrical properties of PCA 5

If the DSP Box is not connected to the Panel PC or the DSP Box power cord is disconnected, the Initialize Baseboard Test will fail with the following Warning:

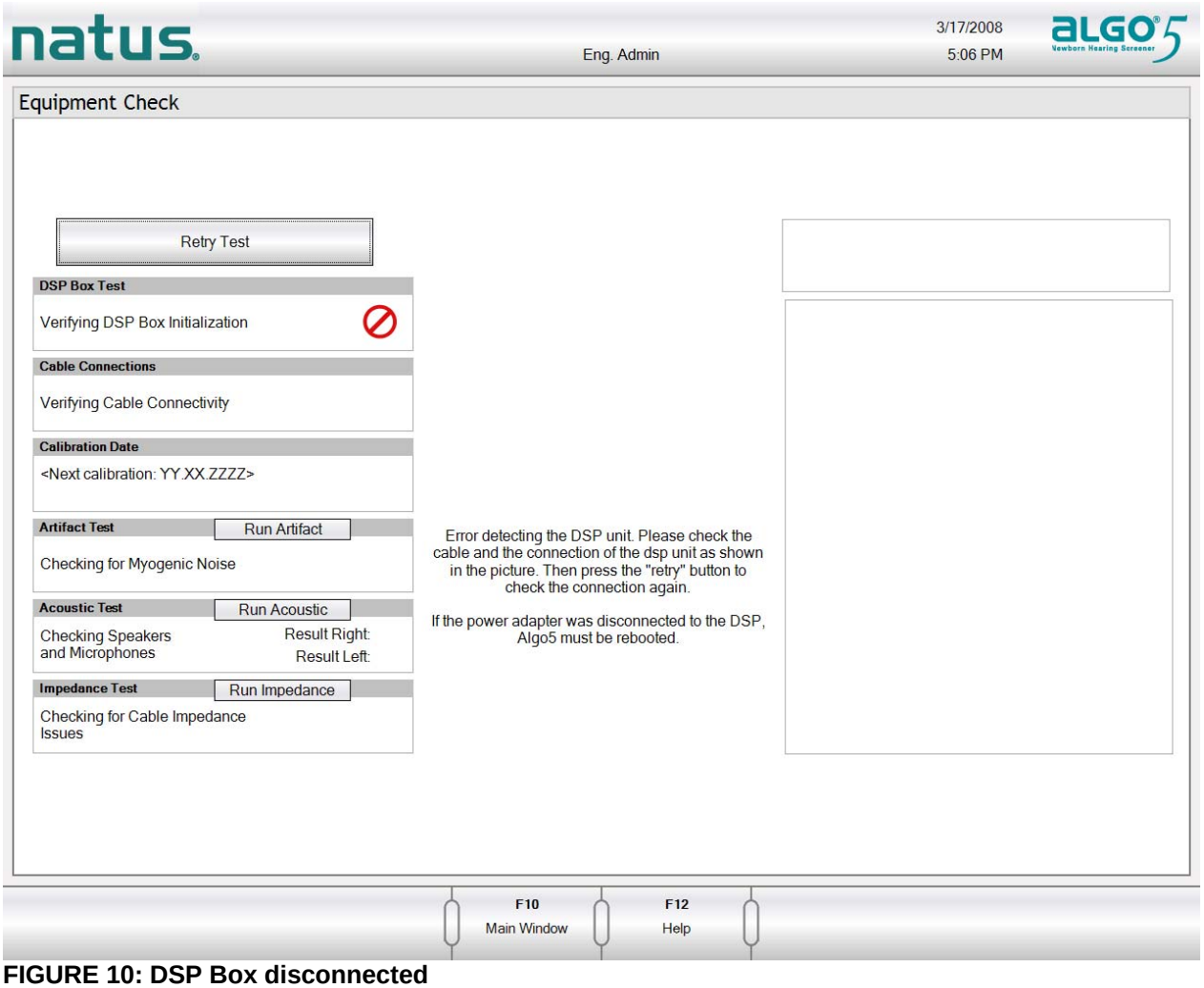


FIGURE 10: DSP Box disconnected

If the Preamp 5 is disconnected, the Cable Connection Test shows a red icon with error message below:

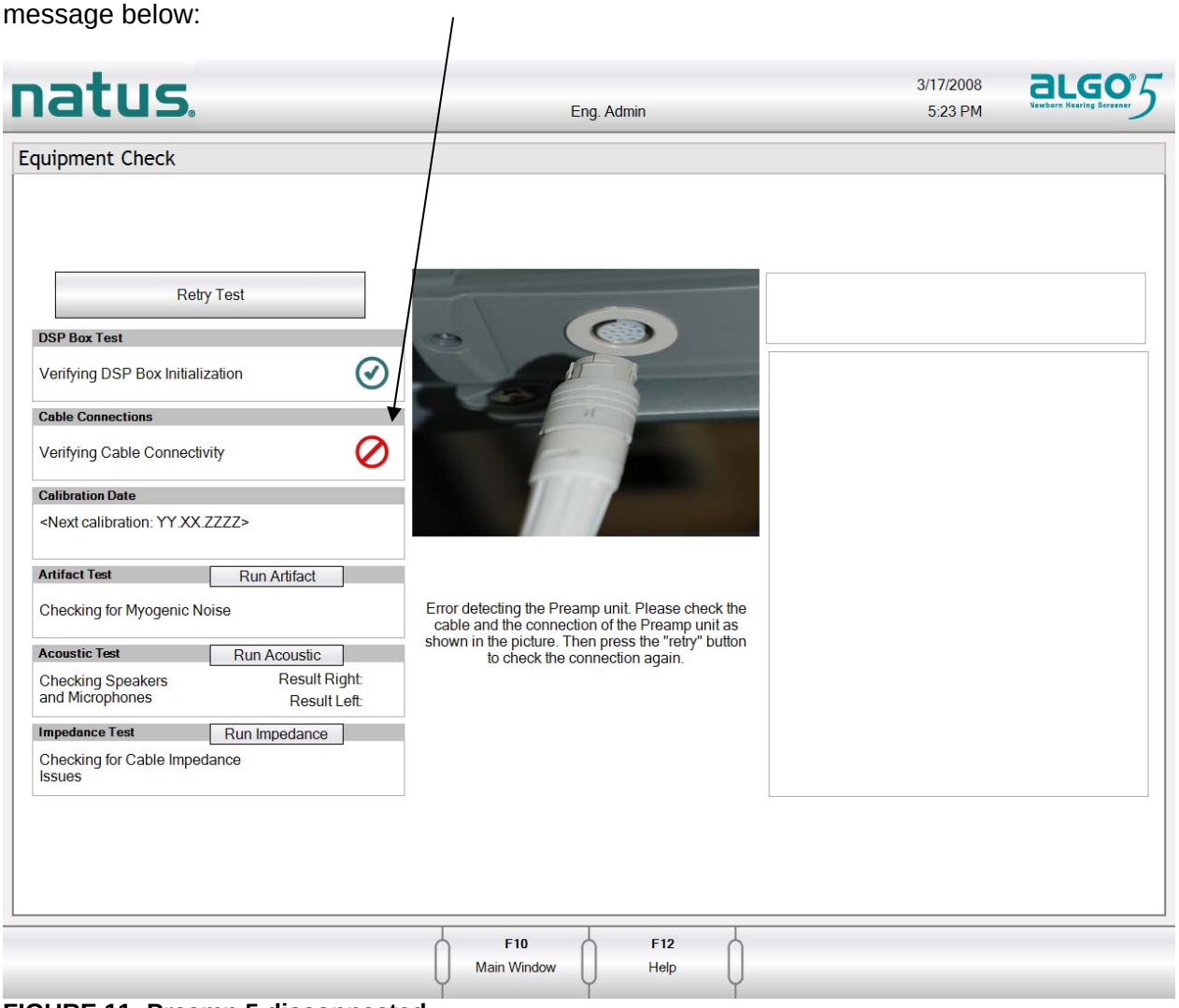


FIGURE 11: Preamp 5 disconnected

If the ATA 5 cable is disconnected, the Cable Connection Test shows a red icon with the error message below:

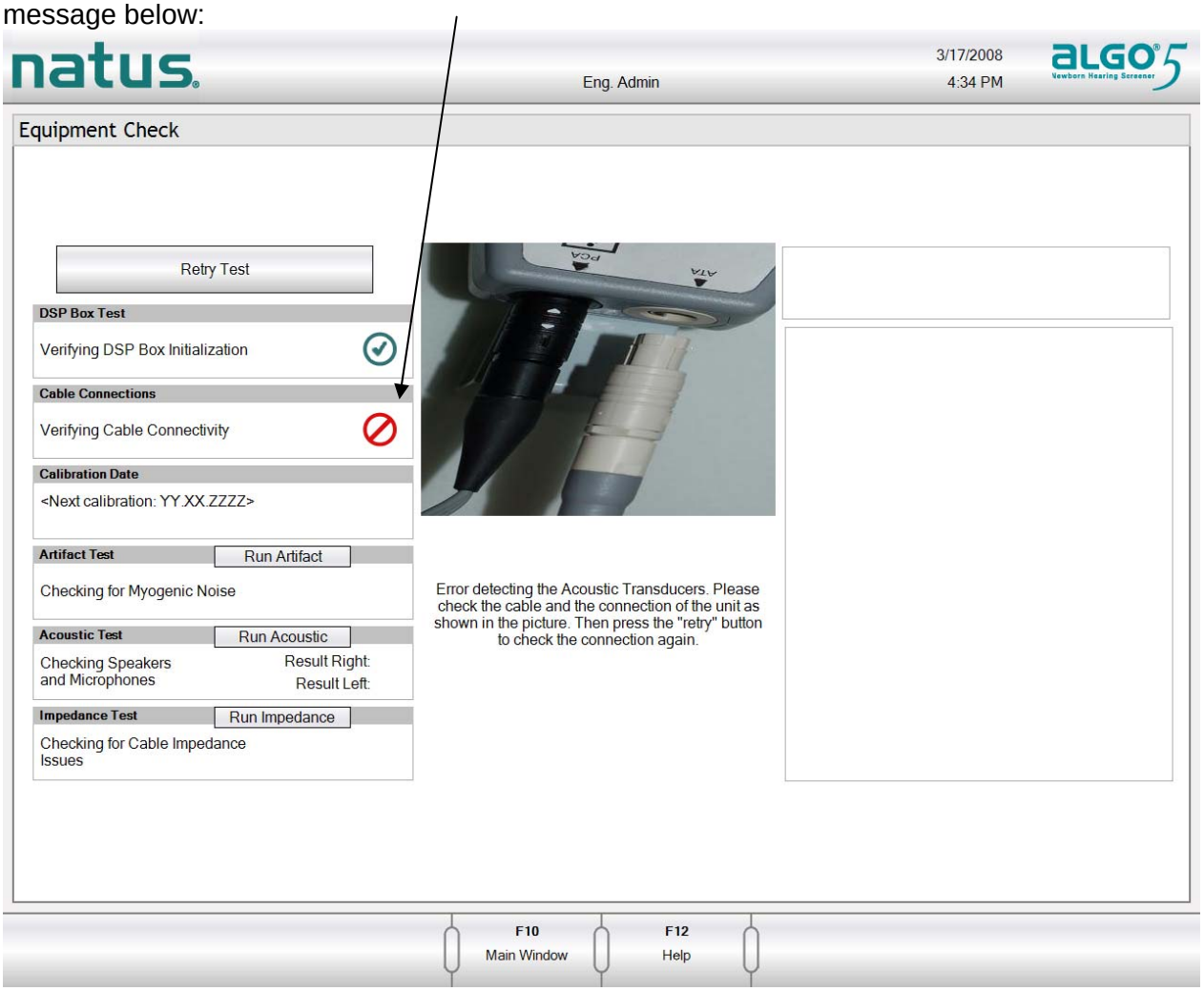


FIGURE 12: ATA 5 disconnected

If the ATA 5 cable is overdue for calibration, the Calibration Dates section in FIGURE 12 shows a red icon next to the <Next calibration> date. Please refer to chapter 2.4.2.2 – ATA 5 Cable calibration due Warnings):

The following figure gives an overview of the hardware components tested during the series of Equipment Check tests.

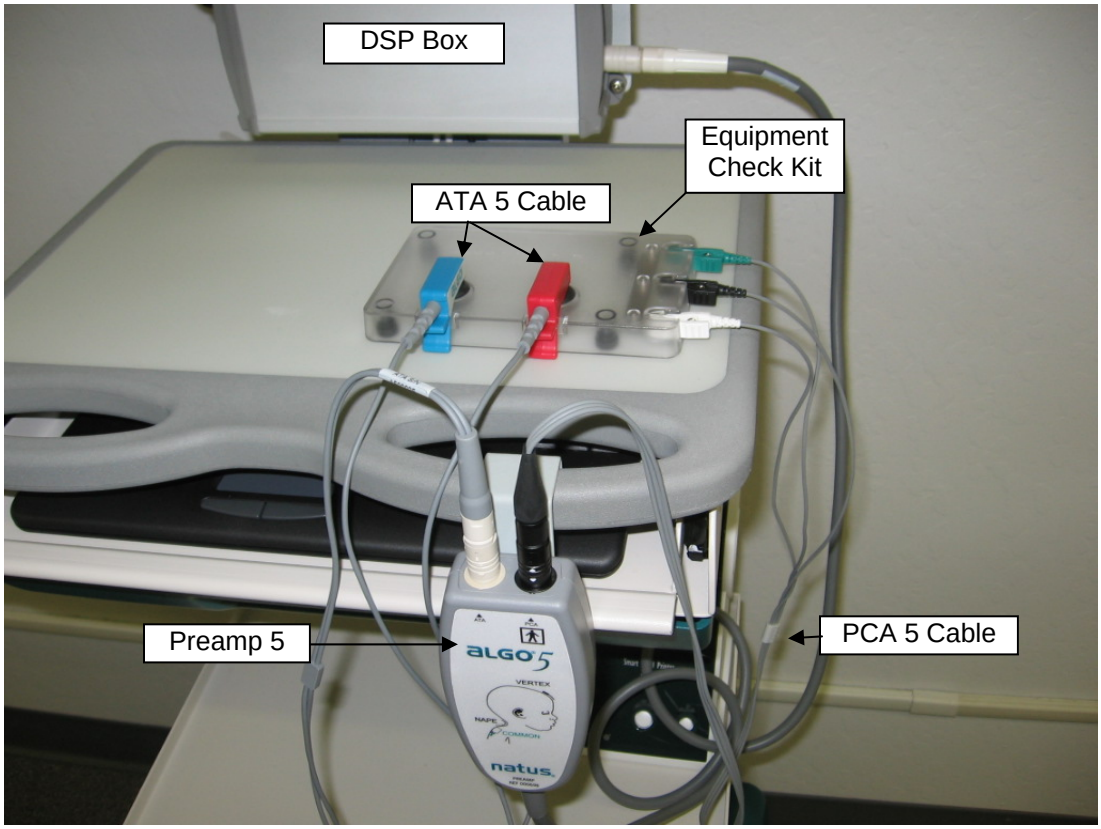


FIGURE 13: Equipment Check - Overview

The following lists each step in the Equipment Check and identifies which device is involved in the testing:

- DSP Box Test – DSP Box and Panel PC
- Cable Connections – ATA 5 and Preamp 5
- Calibration Date – ATA 5
- Artifact Test – DSP Box and Preamp 5
- Acoustic Test – ATA 5
- Impedance Test – PCA 5

2.4.2. Component tests

2.4.2.1. General

The Service Menu allows performing the following tests in non-screening mode:

- Print a test page on Page printer
- Print a test page on Label printer
- Scan a Bar code and view result

2.4.2.2. ATA 5 Cable calibration due Warnings

The ALGO 5 checks the *Due for calibration* date of the ATA 5 each time the screener is turned on. Different Warnings are issued related to the date the screener is turned on. The procedure is described in FIGURE 14.

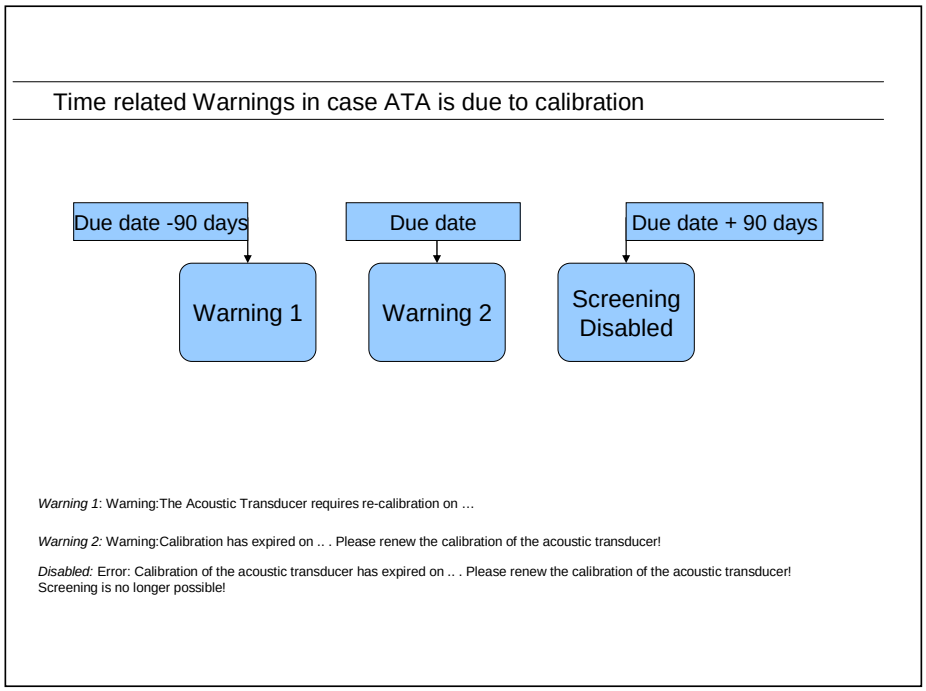

Time related Warnings in case ATA is due to calibration
Due date -90 days
Due date
Due date + 90 days
Warning 1
Warning 2
Screening Disabled
Warning 1: Warning:The Acoustic Transducer requires re-calibration on …
Warning 2: Warning:Calibration has expired on .. . Please renew the calibration of the acoustic transducer!
Disabled: Error: Calibration of the acoustic transducer has expired on .. . Please renew the calibration of the acoustic transducer! Screening is no longer possible!

FIGURE 14: ATA 5 Cable calibration due Warnings

Annual calibration of the ATA 5 cable verifies and/or sets the intensity level of the click or output stimulus.

ATA 5 cable calibration may only be performed by a qualified representative of Natus Medical. For instructions on returning the ATA 5 cable to Natus Medical, contact Natus Technical Service or your local distributor.

3. Troubleshooting Guide

This chapter assumes that you are a qualified biomedical technician who is familiar with the ALGO 5 as described in Chapter 1.

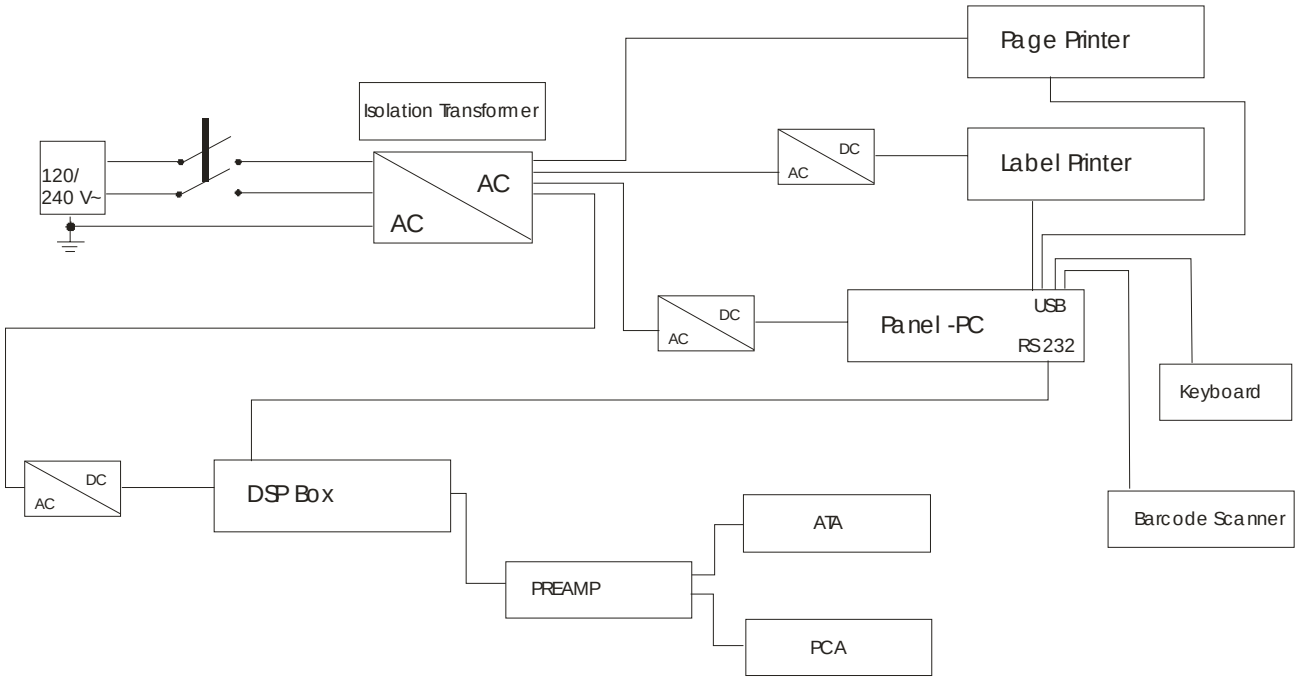


FIGURE 15: Block Diagram wiring

Note: If inkjet page printer is used, that printer requires an auxiliary AC/DC power supply which is supplied with the printer.

3.1. Troubleshooting the ALGO 5

FIGURE 16: Troubleshooting the ALGO 5

Symptom		Probable cause	Corrective Action	Reference
Panel PC does not boot after Main switch is turned on		No power	Verify that AC outlet is functioning.	
		Power switch not in correct position	Ensure power switch is in ON position.	
		Power cord not plugged in all the way, or defective	Check to make sure that power cord is plugged in securely to the device socket. If the device still does not turn on, try another power cord.	
		Power cord for AC/DC adapter loose	Verify that power cord under the bottom shelf is securely plugged in at transformer and at AC/DC adapter. Verify DC plug is securely attached to Panel PC.	
		Blown fuse	Check the fuse in the Isolation Transformer.	Troubleshooting the Isolation Transformer, Section 3.3
		Damaged cable	Perform an end-to-end continuity check on the cables from the AC outlets via the Isolation Transformer to the Panel PC DC inlet cord. Voltage should be 19 VDC.	
		BIOS settings reset	The RTC battery may need to be replaced.	Replacing the RTC Battery, Section 3.2.1
DSP Box	LED does not emit green light after Main switch is turned on	Power cord for AC/DC adapter loose	Verify that power cord in cart column is securely plugged in at Transformer and at AC/DC adapter. Verify DC plug is securely attached to DSP Box.	
		Power cord for AC/DC adapter damaged	Check power cord of AC/DC adapter.	

Symptom		Probable cause	Corrective Action	Reference
		AC/DC adapter broken	Voltage should be 7 VDC. Replace AC/DC adapter if damaged.	
		DSP Box defect	Replace DSP Box.	
	LED emits orange light after screener is turned on	Communication cable is not securely plugged at PC side	Make sure the cable is plugged in all the way into the **COM1** port.	
		DSP Box defect	Replace DSP Box.	
Page printer	Power LED does not light up	Power cord damaged	Replace power cord.	
		Power cord loose	Verify that power cord in cart column is securely plugged in at transformer and at AC/DC adapter (ink jet printer) or directly to printer (laser printer).	
		Printer defect	Replace printer.	
	Printer does not respond	Printer interface cable defective	Replace cable.	
		Printer defect	Replace printer.	
Label printer	Power LED does not light up	Power cord for AC/DC adapter damaged	Replace power cord.	
		Power cord loose	Verify that power cord in cart column is securely plugged in at Transformer and at AC/DC adapter. Verify DC plug is securely attached to Label printer.	
		Printer defect	Replace printer.	
	Printer does not respond	Printer interface cable defective	Replace interface cable.	
		Printer defect	Replace printer.	
Barcode scanner	Barcode scanner does not respond	Barcode scanner defect	Replace Barcode scanner	
Cart		Roller is worn out	Contact Natus Technical Service.	

3.2. Troubleshooting the Panel PC

3.2.1. Replacing the battery for the RTC (Real Time Clock) on the Panel PC

Tools needed: Phillips Screwdriver, #2

- Unplug all the cables and power cords going to the Panel PC. Make note of what ports cables are connected to.
- Remove the Panel PC from the cart and place it with the screen facing down on a table.
- Remove the 11 M3 x 10mm Phillips screws (Natus P/N 800213) that hold the outer shell on and remove the outer shell.

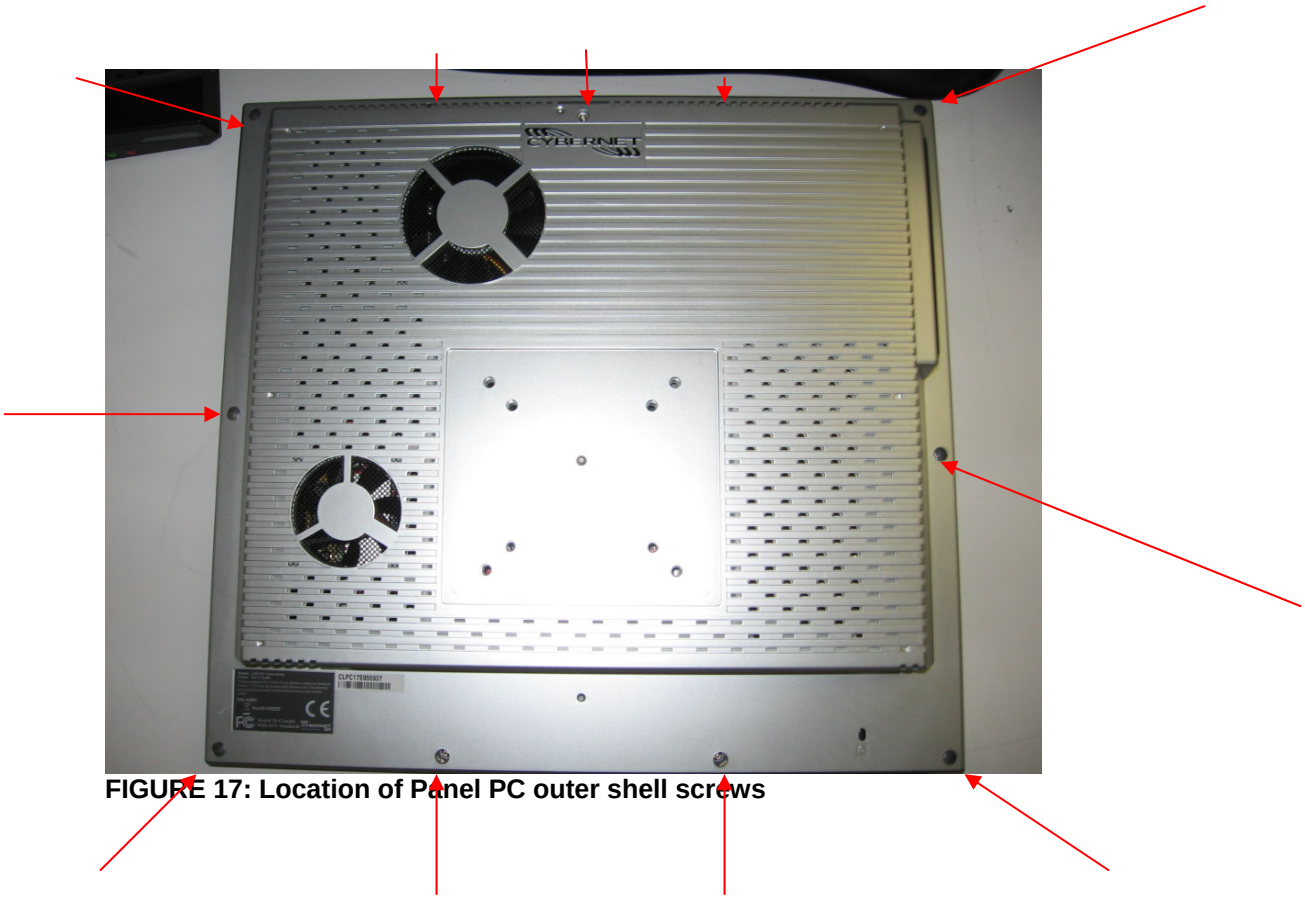


FIGURE 17: Location of Panel PC outer shell screws

- Remove the 16 M3 x 5 mm Phillips screws (Natus P/N 800212) that hold the inner shell on (including the 2 screws that attach the plate with the connectors) and carefully pry it open to expose the motherboard.

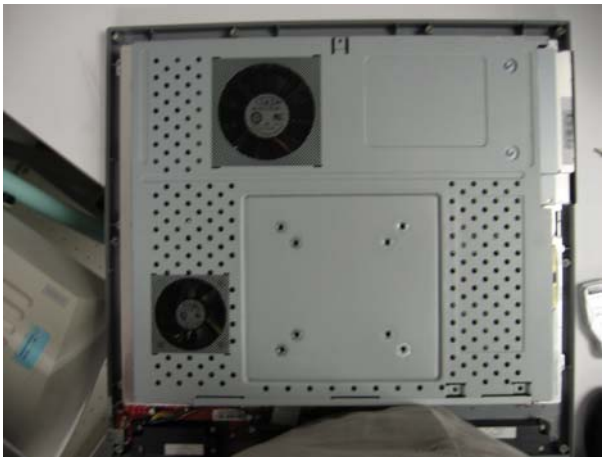


FIGURE 18: View outer shell Panel PC

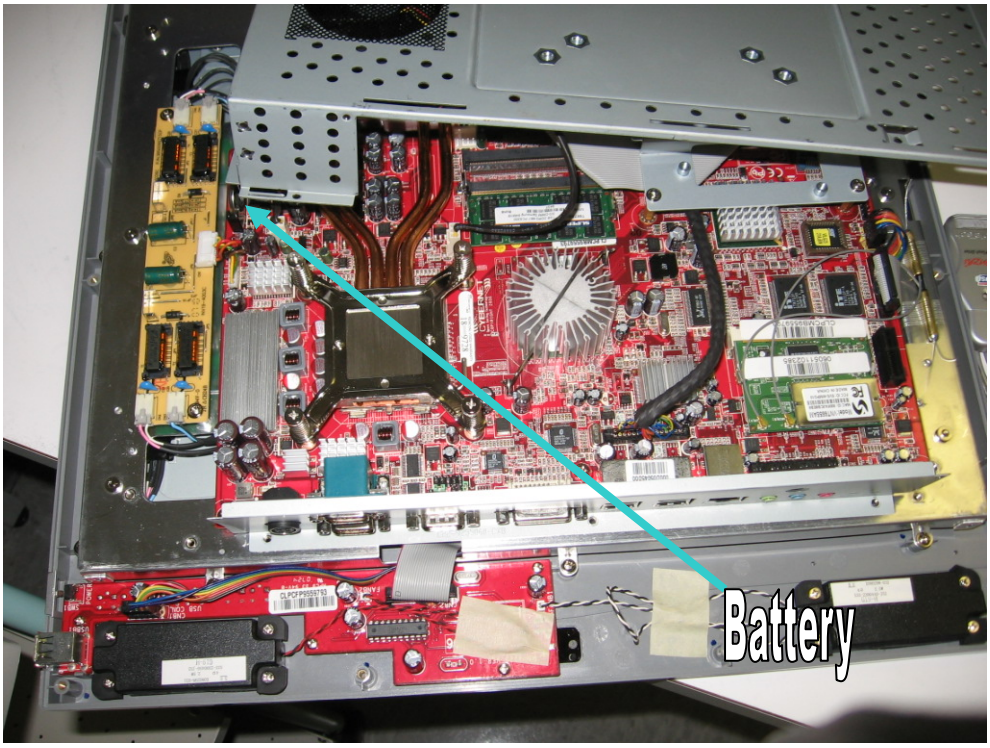


FIGURE 19: Location of Battery on Motherboard Panel PC

- Remove the RTC battery and replace it with the recommended battery (P/N 000972, 3V coin-cell Lithium battery CR2032).

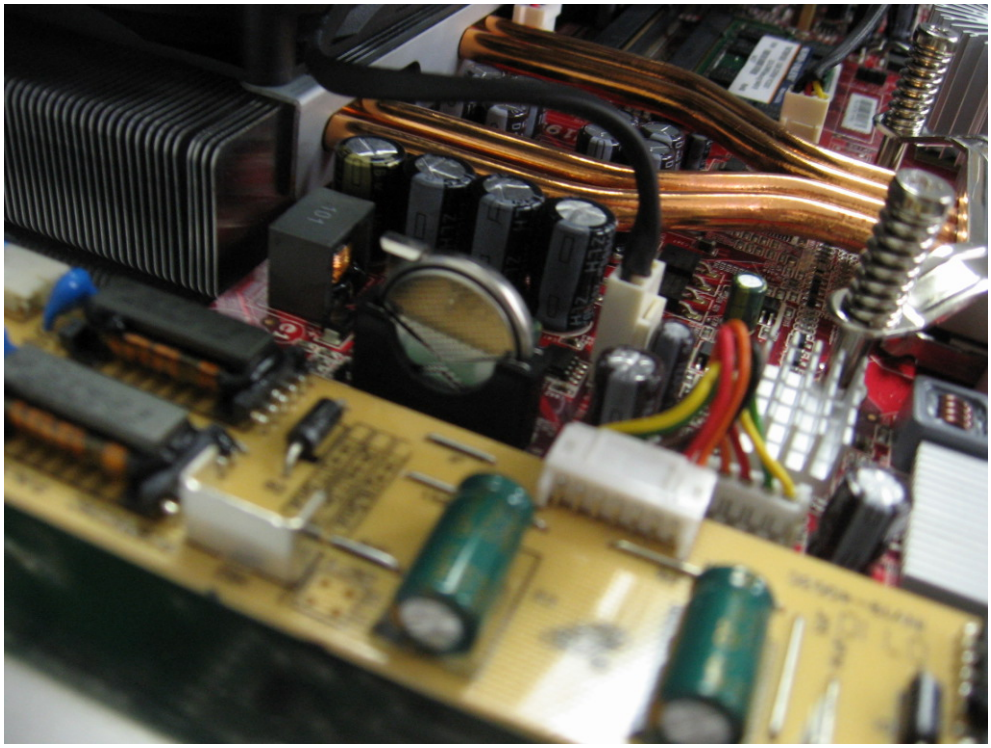


FIGURE 20: Detail View RTC Battery on Panel PC

- Reassemble the Panel PC by following the above steps in reverse, and mount the Panel PC back on the cart. Take care to tighten the mounting screws on the cart so that it is secure.
- After replacing the RTC Battery, it may be necessary to set the BIOS settings on the Panel PC to automatically turn the Panel PC on when the main power switch is turned on.
  - After turning on the main power switch, press the button on the lower right side of the Panel PC. Immediately press and hold down the Delete key until “Entering Setup” appears.
  - Select the “Power Management Setup” option, press Enter
  - Select “PWR ON After PWR-Fail”. Press Enter, and select the option for “On” and press Enter.
  - Press F10 to save, type in “Y”, and press Enter. The system will then reboot and should operate normally.

3.3. Troubleshooting the Isolation Transformer

Follow the steps below to change the Isolation Transformer's fuse:

- Unplug the power cable leading from the Isolation Transformer to the wall.
- Locate the power inlet module on the Isolation Transformer. Note the orientation of the power inlet module so as to put it back in the same direction.
- Using a flat head screwdriver, open the power inlet module to access the fuse holder (refer to FIGURE 21: Open the power inlet module).

FIGURE 21: Open the power inlet module

- Using a flat head screwdriver, remove the fuse holder from the drawer (refer to FIGURE 22)

FIGURE 22: Access to the fuse holder

- The fuses should be installed as illustrated in below. There are 2 fuses -- one on each side (refer to FIGURE 23).

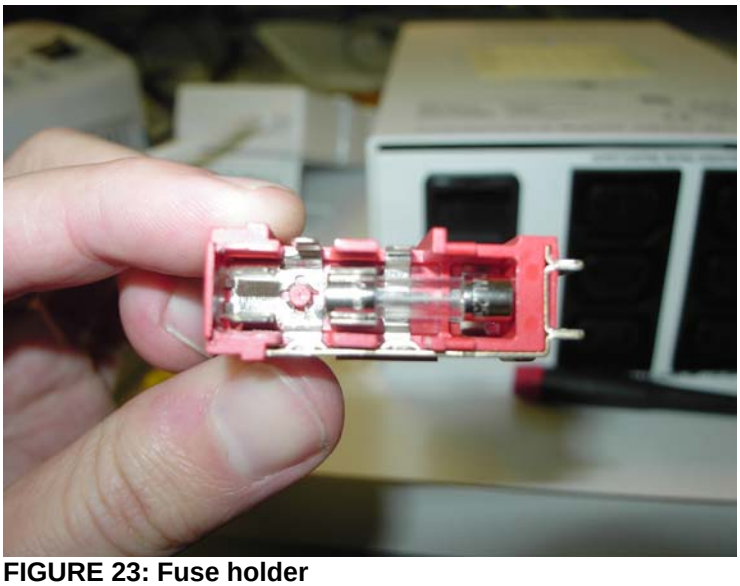


FIGURE 23: Fuse holder

If the fuses are faulty, replace them with the following type of fuses:

115V:
6.3A,Slo-blw,5x20mm,250V
Natus Part number:000801
Suggested manufacturer: Schurter (P/N 0034.3125)

230V:
3.15A,Slo-blw,5x20mm,250V
Natus Part number:000800
Suggested manufacturer: Schurter (P/N 0034.3122)

Reverse the above steps to complete the fuse replacement, making sure that the voltage selection is the same as it was before the fuses were replaced.

3.4. Troubleshooting the ATA 5

- Run the Acoustic Check as shown below. If Acoustic Check shows a failure condition, refer to Section 4.3 – High Refer Rate and Section 4.4 – High Ambient.

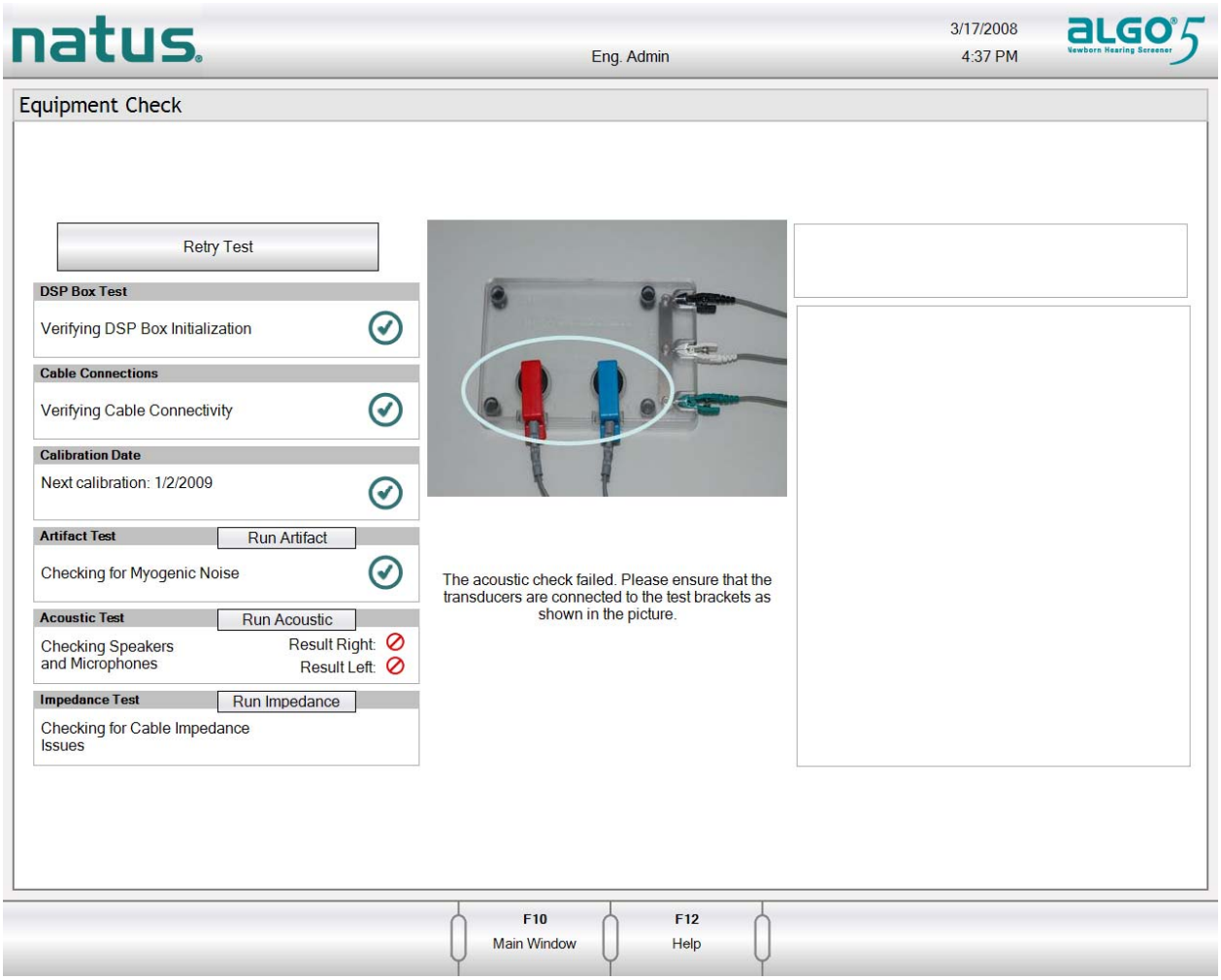


FIGURE 24: Acoustic Check

3.5. Troubleshooting the Preamp 5

- Run the Impedance and Artifact Checks as shown below. If the Impedance Check shows a failure condition, refer to Section 4.1 – High Impedance.

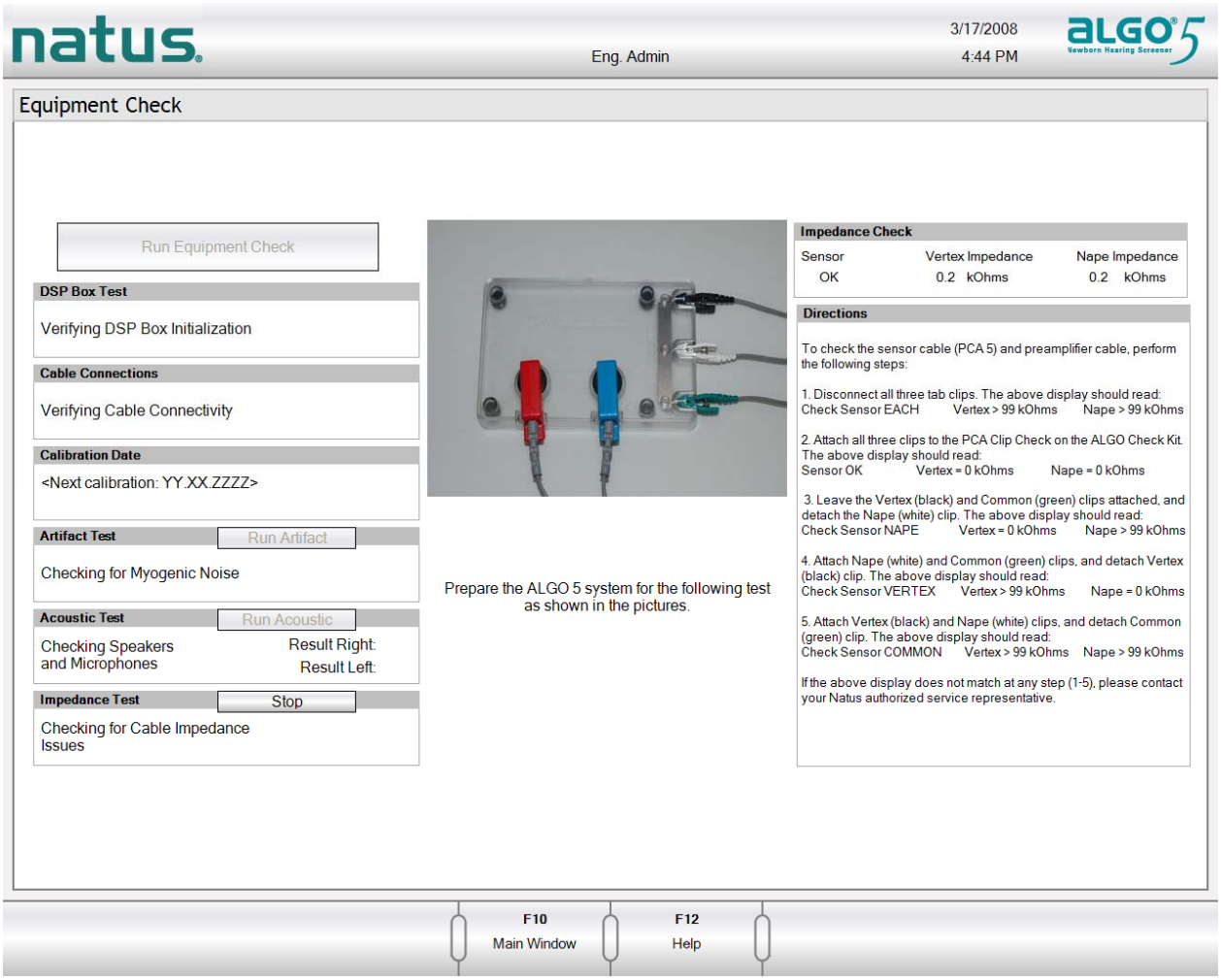

natus
Eng. Admin
3/17/2008
4:44 PM
ALGO 5
Newborn Hearing Screener
Equipment Check
Run Equipment Check
DSP Box Test
Verifying DSP Box Initialization
Cable Connections
Verifying Cable Connectivity
Calibration Date
<Next calibration: YY.XX.ZZZZ>
Artifact Test
Run Artifact
Checking for Myogenic Noise
Acoustic Test
Run Acoustic
Checking Speakers and Microphones
Result Right:
Result Left:
Impedance Test
Stop
Checking for Cable Impedance Issues
Prepare the ALGO 5 system for the following test as shown in the pictures.
Impedance Check
Sensor
Vertex Impedance
Nape Impedance
OK
0.2 kOhms
0.2 kOhms
Directions
To check the sensor cable (PCA 5) and preamplifier cable, perform the following steps:
1. Disconnect all three tab clips. The above display should read:
Check Sensor EACH Vertex > 99 kOhms Nape > 99 kOhms
2. Attach all three clips to the PCA Clip Check on the ALGO Check Kit. The above display should read:
Sensor OK Vertex = 0 kOhms Nape = 0 kOhms
3. Leave the Vertex (black) and Common (green) clips attached, and detach the Nape (white) clip. The above display should read:
Check Sensor NAPE Vertex = 0 kOhms Nape > 99 kOhms
4. Attach Nape (white) and Common (green) clips, and detach Vertex (black) clip. The above display should read:
Check Sensor VERTEX Vertex > 99 kOhms Nape = 0 kOhms
5. Attach Vertex (black) and Nape (white) clips, and detach Common (green) clip. The above display should read:
Check Sensor COMMON Vertex > 99 kOhms Nape > 99 kOhms
If the above display does not match at any step (1-5), please contact your Natus authorized service representative.
F10
Main Window
F12
Help

FIGURE 25: Impedance Check

- If the Artifact Check shows a failure condition, refer to Section 4.2 – High Myogenic.

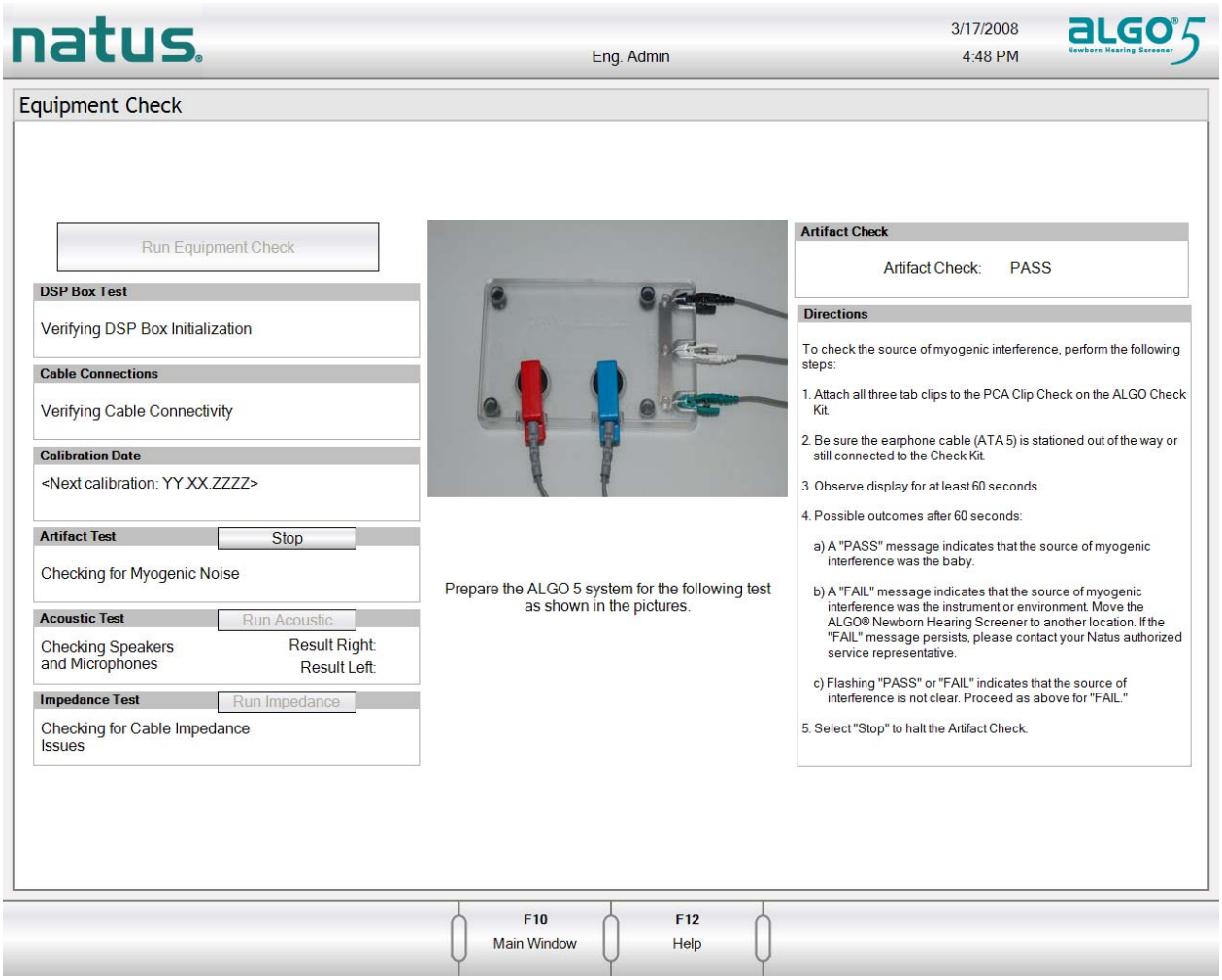

natus
Eng. Admin
3/17/2008
4:48 PM
ALGO 5
Newborn Hearing Screener
Equipment Check
Run Equipment Check
DSP Box Test
Verifying DSP Box Initialization
Cable Connections
Verifying Cable Connectivity
Calibration Date
<Next calibration: YY.XX.ZZZZ>
Artifact Test
Stop
Checking for Myogenic Noise
Acoustic Test
Run Acoustic
Checking Speakers and Microphones
Result Right:
Result Left:
Impedance Test
Run Impedance
Checking for Cable Impedance Issues
Prepare the ALGO 5 system for the following test as shown in the pictures.
Artifact Check
Artifact Check: PASS
Directions
To check the source of myogenic interference, perform the following steps:
1. Attach all three tab clips to the PCA Clip Check on the ALGO Check Kit.
2. Be sure the earphone cable (ATA 5) is stationed out of the way or still connected to the Check Kit.
3. Observe display for at least 60 seconds.
4. Possible outcomes after 60 seconds:
a) A "PASS" message indicates that the source of myogenic interference was the baby.
b) A "FAIL" message indicates that the source of myogenic interference was the instrument or environment. Move the ALGO® Newborn Hearing Screener to another location. If the "FAIL" message persists, please contact your Natus authorized service representative.
c) Flashing "PASS" or "FAIL" indicates that the source of interference is not clear. Proceed as above for "FAIL."
5. Select "Stop" to halt the Artifact Check.
F10
Main Window
F12
Help

FIGURE 26: Artifact Check

3.6. Troubleshooting the PCA 5

- Run the Impedance Check as shown below. If the Impedance Check shows a failure condition, refer to Section 4.1 – High Impedance.

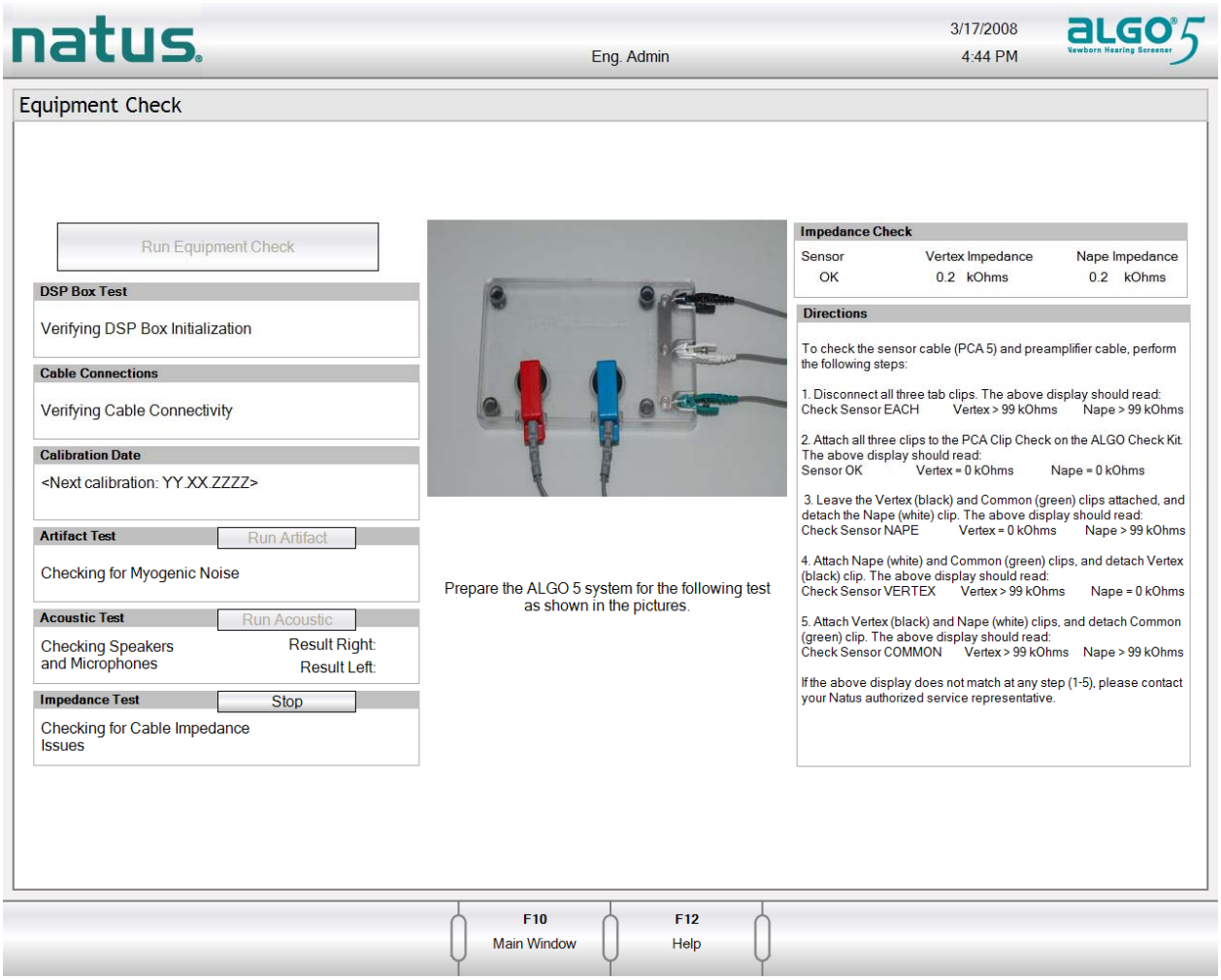

natus
Eng. Admin
3/17/2008
4:44 PM
ALGO 5
Newborn Hearing Screener
Equipment Check
Run Equipment Check
DSP Box Test
Verifying DSP Box Initialization
Cable Connections
Verifying Cable Connectivity
Calibration Date
<Next calibration: YY.XX.ZZZZ>
Artifact Test
Run Artifact
Checking for Myogenic Noise
Acoustic Test
Run Acoustic
Checking Speakers and Microphones
Result Right:
Result Left:
Impedance Test
Stop
Checking for Cable Impedance Issues
Prepare the ALGO 5 system for the following test as shown in the pictures.
Impedance Check
Sensor
Vertex Impedance
Nape Impedance
OK
0.2 kOhms
0.2 kOhms
Directions
To check the sensor cable (PCA 5) and preamplifier cable, perform the following steps:
1. Disconnect all three tab clips. The above display should read:
Check Sensor EACH Vertex > 99 kOhms Nape > 99 kOhms
2. Attach all three clips to the PCA Clip Check on the ALGO Check Kit. The above display should read:
Sensor OK Vertex = 0 kOhms Nape = 0 kOhms
3. Leave the Vertex (black) and Common (green) clips attached, and detach the Nape (white) clip. The above display should read:
Check Sensor NAPE Vertex = 0 kOhms Nape > 99 kOhms
4. Attach Nape (white) and Common (green) clips, and detach Vertex (black) clip. The above display should read:
Check Sensor VERTEX Vertex > 99 kOhms Nape = 0 kOhms
5. Attach Vertex (black) and Nape (white) clips, and detach Common (green) clip. The above display should read:
Check Sensor COMMON Vertex > 99 kOhms Nape > 99 kOhms
If the above display does not match at any step (1-5), please contact your Natus authorized service representative.
F10
Main Window
F12
Help

FIGURE 27: Impedance Check

4. Technical Troubleshooting Guide

4.1. High Impedance

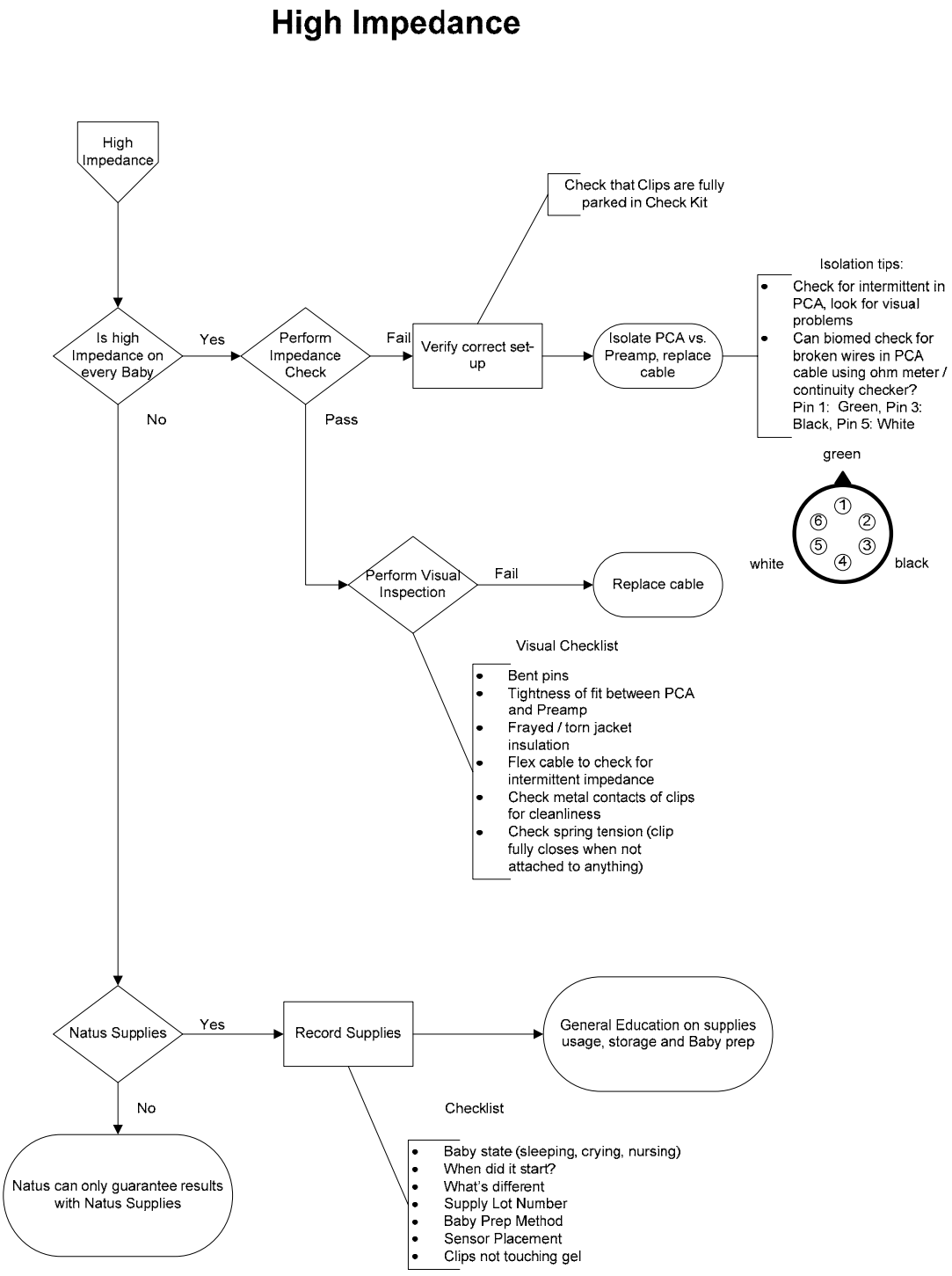

High Impedance
High Impedance
Is high Impedance on every Baby
Yes
No
Perform Impedance Check
Fail
Pass
Verify correct set-up
Check that Clips are fully parked in Check Kit
Isolate PCA vs. Preamp, replace cable
Isolation tips:
Check for intermittent in PCA, look for visual problems
Can biomed check for broken wires in PCA cable using ohm meter / continuity checker? Pin 1: Green, Pin 3: Black, Pin 5: White
green
white
black
Perform Visual Inspection
Fail
Replace cable
Visual Checklist
Bent pins
Tightness of fit between PCA and Preamp
Frayed / torn jacket insulation
Flex cable to check for intermittent impedance
Check metal contacts of clips for cleanliness
Check spring tension (clip fully closes when not attached to anything)
Natus Supplies
Yes
No
Record Supplies
General Education on supplies usage, storage and Baby prep
Checklist
Baby state (sleeping, crying, nursing)
When did it start?
What's different
Supply Lot Number
Baby Prep Method
Sensor Placement
Clips not touching gel
Natus can only guarantee results with Natus Supplies

FIGURE 28: High Impedance

4.2. High Myogenic

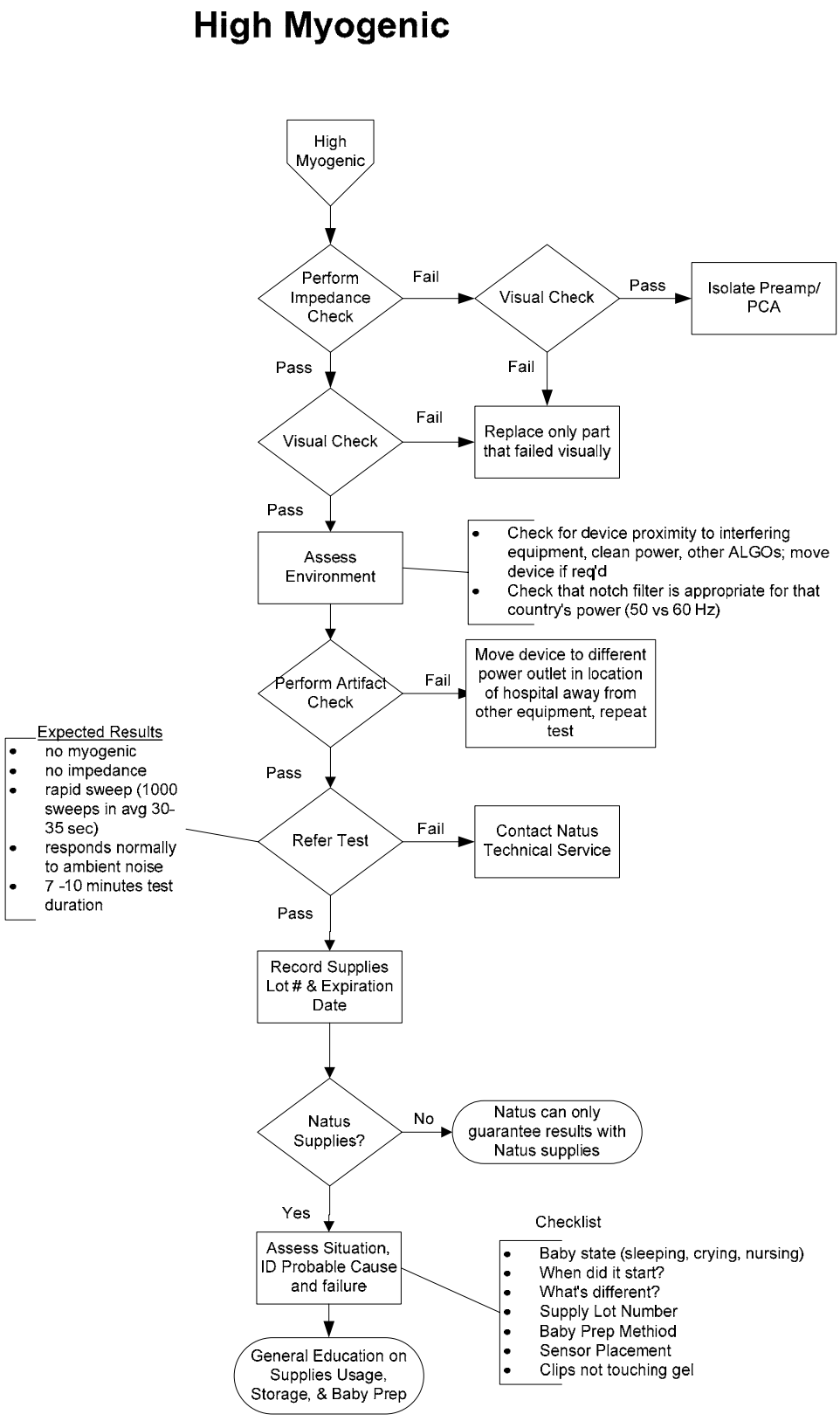


FIGURE 29: High Myogenic

4.3. High Refer Rate

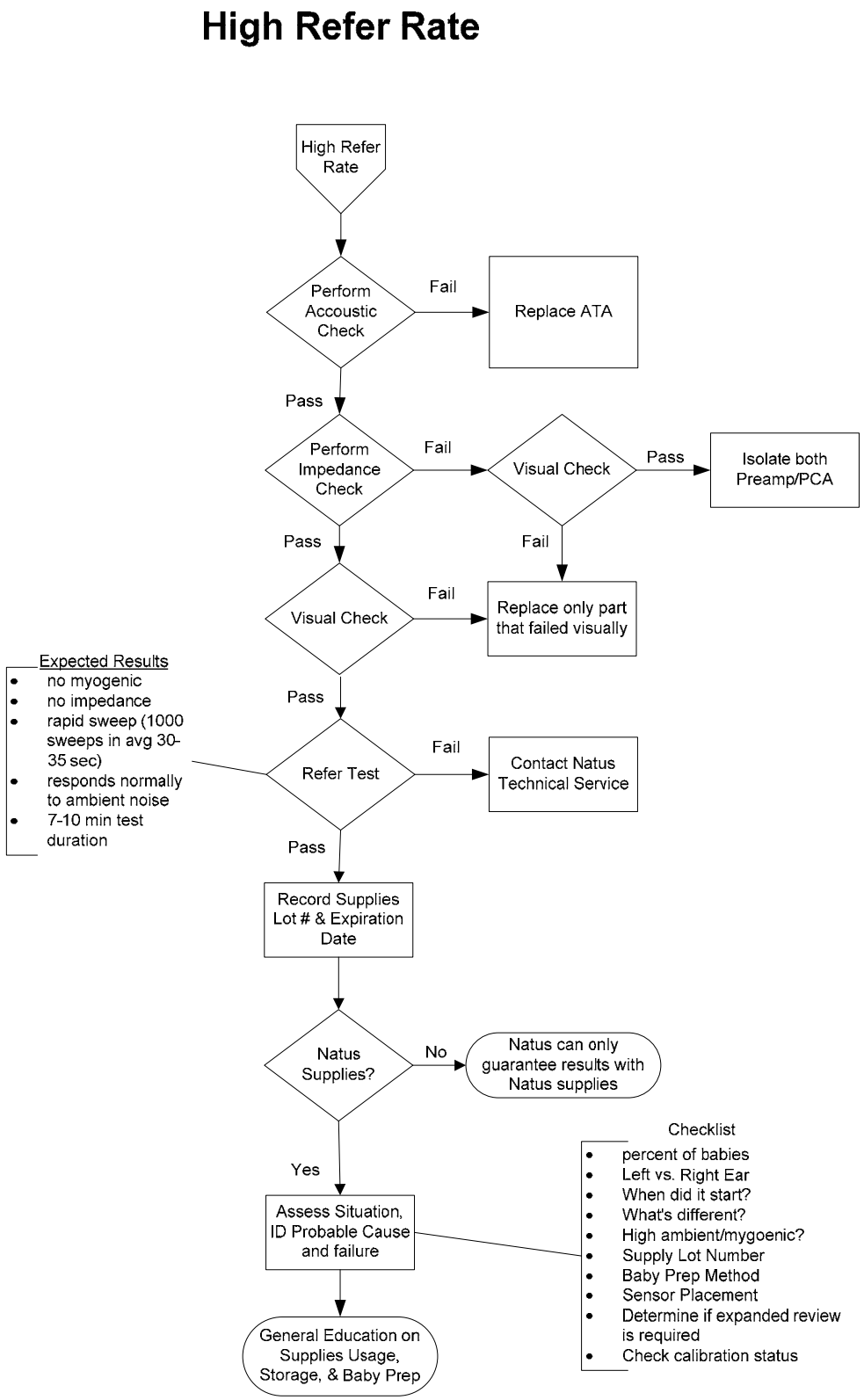


FIGURE 30: High Refer Rate

4.4. High Ambient

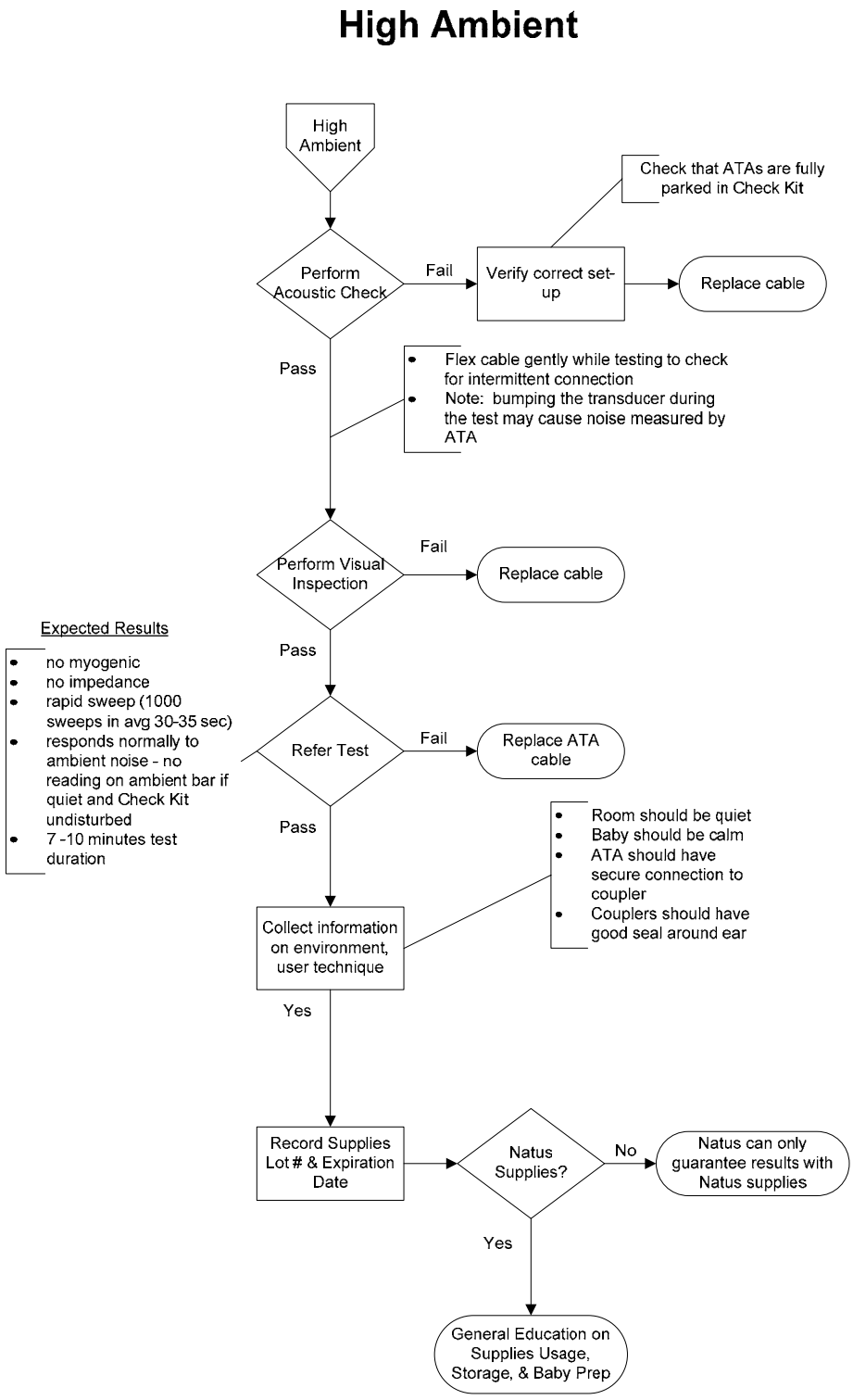

High Ambient
High Ambient
Check that ATAs are fully parked in Check Kit
Perform Acoustic Check
Fail
Verify correct set-up
Replace cable
Pass
Flex cable gently while testing to check for intermittent connection
Note: bumping the transducer during the test may cause noise measured by ATA
Perform Visual Inspection
Fail
Replace cable
Pass
Expected Results
no myogenic
no impedance
rapid sweep (1000 sweeps in avg 30-35 sec)
responds normally to ambient noise - no reading on ambient bar if quiet and Check Kit undisturbed
7 -10 minutes test duration
Refer Test
Fail
Replace ATA cable
Pass
Room should be quiet
Baby should be calm
ATA should have secure connection to coupler
Couplers should have good seal around ear
Collect information on environment, user technique
Yes
Record Supplies Lot # & Expiration Date
Natus Supplies?
No
Natus can only guarantee results with Natus supplies
Yes
General Education on Supplies Usage, Storage, & Baby Prep

FIGURE 31: High Ambient

5. Parts and Specifications

5.1. How to order parts

Call Technical Service at 1-888-496-2887 to order parts or for general technical information. A minimum order may be required for spare parts.

5.2. Parts list

The column headings in the Parts List table are:

Part# Natus part number, for ordering the part
Name Name of the part
Reference Reference to illustration elsewhere in Service Manual

See the ALGO 5 Assembly Instructions for additional details on part identification.

TABLE 4: Parts List for Natus ALGO 5 system

Part #	Name	Reference
000540	Rear Post Cover	N/A
000619	DSP Box with Communication Cable	FIGURE 3
000696	PCA 5	FIGURE 6
000698	Preamp 5	FIGURE 4
000699	ATA 5	FIGURE 5
000734	PANEL PC	FIGURE 1
000739	Cart, (115V)	FIGURE 1,2
000740	DSP power supply	n/a
000741	Isolation Transformer	Default configuration is 115V, part comes with fuses for 230V
000745	Drawer Slider	Order in sets of two
000779	Power Cord	Used with Laser Printer, DSP Box, Label Printer, and Panel PC
000800	Fuse (3.15A,Slo-blw,5x20mm,250V)	FIGURE 23
000801	Fuse (6.3A,Slo-blw,5x20mm,250V)	FIGURE 23
000834	Cart Base with Casters	n/a
000839	DSP Mounting Bracket	n/a
000840	Panel PC Mounting Bracket	n/a
000847	Nylon Thumb Screw	Used w/ Panel PC Power Supply
000850	Screw, 10-32 X 1/2“ SHCS-PATCH, SST	n/a

000862	Cart, (230V)	FIGURE 1, FIGURE 2
000906	Cart Column with Peripherals	FIGURE 1, FIGURE 2
000907	Keyboard (USB)	FIGURE 1
000920	Velcro Strap	FIGURE 2
000921	Inkjet Printer Power Cord	n/a
000954	Label Printer, Seiko SLP 440	FIGURE 1
000962	Spare Hardware Kit	Includes spare hardware to match set originally shipped with ALGO 5 system
000972	Lithium battery CR2032, 3V coin-cell	FIGURE 19
030734	USB Cable	n/a
040527	Equipment Check Kit	FIGURE 8
040950	Page Printer-Inkjet	FIGURE 1, FIGURE 2
040951	Page Printer-Laser	FIGURE 1, FIGURE 2
040947	Barcode Scanner	FIGURE 2
040948	LAN Isolator	n/a
700090	Power Cord, US	n/a
700138	Power Cord, AU	n/a
800080	Screw, flathead phillips, 10-32X1/2	Used with DSP bracket
800197	Screw, hex, 1/4-20X3/4” SST	Used with DSP bracket
900022	Sticky Tape, Double Back, 1”	Used for Power Supplies
900028 / 900029	Dual Lock	Used for mounting Label Printer. If Dual Lock must be replaced, order both 900028 & 900029

5.3. Specifications

Note: Specifications are subject to change without notice

Power Supply: Power Rating 120 V~, or 240 V~; 600VA, 50/60Hz

Nominal Dimensions: Cart 64” (163 cm) x 20” (51 cm) x 20” (51 cm) (H x W x D)

Nominal Weight: Cart 110 lbs (50 kg)

Cart fully equipped: 140 lbs (63.5 kg)

Compliance Standards:

EN60601-1
EN60601-1-2
EN60601-1-4
UL60601-1
CAN/CSA 22.2 601-1

Classifications

Electrical Safety Class 1 equipment, BF type applied part

Ordinary equipment for protecting against ingress of water

Operating Temperature: 10ºC - 35ºC (50ºF - 95ºF)

Storage Temperature: -20ºC - 40ºC (-4ºF - 104ºF)

Humidity: 10% – 90% rel. (non-condensing)

Operating Altitude: sea level – 1800 m (6000ft)

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